mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment Report and Environmental Management Programme

for Listed Activities Associated with Proposed Underground Mining Expansion Project and Consolidated Environmental Management Plan of the Exxaro Dorstfontein East Coal Mine Operations, near Kriel, Mpumalanga Province

DMRE Reference Number: 30/5/1/1/2/3/1/51

Environmental Authorisation in Support of the Exxaro Dorstfontein East Coal Mine Expansion Project

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 OF 2002) (MPRDA) (AS AMENDED).

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File Reference Number SAMRAD:	Ref. No.: 30/5/1/1/2/3/1/51

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Draft Environmental Impact Assessment and Environmental Management Plan Report**
Project Name:	**Integrated Environmental Impact Assessment for the Proposed Underground Mining Expansion Project and Consolidated Environmental Management Plan of the Exxaro Dorstfontein East Coal Mine Operations, near Kriel, Mpumalanga**
Project Code:	**EXX5725**

Name	**Responsibility**	**Signature**	**Date**
Anela Sotashe	Report Compiler		September 2021
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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation (EA) can be granted following the evaluation of an Environmental Impact Assessment (EIA) and an Environmental Management Programme (EMPr) report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the EA being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner (EAP) must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein (unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the EIA process is to, through a consultative process—

- Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage , and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
  - the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - the degree to which these impacts—
    - can be reversed;
    - may cause irreplaceable loss of resources; and
    - can be managed, avoided or mitigated.
- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
  - Identify and motivate a preferred site, activity and technology alternative;
  - Identify suitable measures to manage, avoid or mitigate identified impacts; and
  - Identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Exxaro Coal Central (Pty) Ltd (ECC) holds an approved Mining Right (MR) (**MP30/5/1/2/2/51MR)** for opencast and underground mining at the Dorstfontein East Coal Mine (DECM) situated in Kriel, Mpumalanga Province. DECM was previously owned by Total Coal South Africa (Pty) Ltd (Total) and was ceded to ECC on 20 August 2015. The current proposal aims to extend underground mining in the approved mining area and introduce ancillary surface infrastructure to support this.

ECC has approval to mine the Lower 4 Seam and the Lower 2 Seam and is also authorised to mine three open pits. The operation has an approved Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) dated October 2017 (SRK Consulting).

An application for Environmental Authorisation (EA) for this Project was submitted to the Mpumalanga Department of Mineral Resources and Energy (DMRE) on 13 November 2020. The final Scoping Report (SR) was submitted to the DMRE on 26 January 2021 and was accepted on 28 May 2021 with **(Ref. No. 30/5/1/1/2/3/1/51)**.

This report is the Draft EIA and EMPr for the Project and integrates, amongst others, all the findings of specialist studies; impacts and mitigation measures; and aligns existing EMPrs for the DECM.

An alignment of all EMPrs will ensure that ECC incorporates all current and future proposed activities associated for the DECM operation into a single management document. The following EMPrs require alignment into one operational EMPr for the DECM operations:

- EMPr for Mining Right [Ref. No. MP 30/5/1/2/2/51MR] (April 2008);
- EMPr Amendment for Mining Right [Ref. No. MP 30/5/1/2/2/51MR] (August 2009); and
- EIA/EMPr for the Dorstfontein East Mine Extension of Pit 1 and Water Transportation Pipeline from Dorstfontein West to Dorstfontein East [Ref No. MP 30/5/1/2/3/2/1 (51) MR] (SRK, October 2017).

The proposed expansion of the underground mining operation and introduction of ancillary infrastructure triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 04 December 2014, as amended) (EIA Regulations, 2014) as promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), requiring that a Scoping and EIA Process be undertaken to obtain an EA.

Due to the extensive environmental on-site investigations that was required for this project, the Applicant applied to extend the submission deadline of the final EIA/EMPr and this extension has not yet been approved by the DMRE.

Furthermore, a Water Use Licence Application (WULA) in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) is required to lawfully undertake the proposed mining activities.

Project Applicant

The details of the Project Applicant are included in the table below.

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Project Overview

The DECM is situated in the Mpumalanga Province near the town of Kriel. DECM operates under an approved MR (Ref. No. **MP 30/5/1/2/2/51 MR**) for opencast and underground mining and intends to extend the existing underground mining area associated with the 2 Seam and 4 Seam targets to the farms Dorstfontein 71 IS, Boschkrans 53 IS, Fentonia 54 IS, and Welstand 55 IS (the "Project''). A portion of the 4 Seam underground extension area situated in the southwest portion of the MR boundary will be mined. This portion will be accessed from the Dorstfontein West operations. DECM therefore intends to further extend the Life-of-Mine (LoM) through the exploitation of these identified additional coal reserves between 2021 until 2034 (14 years).

Environmental Assessment Practitioner Contact Details

The contact details for the independent Environmental Assessment Practitioner (EAP) are provided in the table below.

Company Name:	Digby Wells and Associates (South Africa) (Pty) Ltd
Name of Practitioner:	Kelly Tucker
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Public Participation Process

A Public Participation Process (PPP) was initiated during the Application Phase. Public participation is an important aspect of the investigation of environmental and social impacts since it allows stakeholders affected by the project an opportunity to voice their opinions and concerns. The process also seeks to ensure that local knowledge, needs and values are well understood and considered in the EIA process. The comments from the stakeholders are included in the Comment and Response Report (CRR) (Attached in Appendix C). The PPP which was undertaken in line with the legislative requirement as discussed in Section 10.

During the EIA Phase, the following main PPP activities will be undertaken:

- Provide feedback on the findings of the specialist studies and mitigation measures proposed by means of consultation with I&APs;
- Release the Draft EIA and associated specialist studies for public for comment;
- Consult with I&APs through focus group meetings; and
- Include of all comments raised during this period in the CRR.

The Draft EIA and EMPr will undergo a 30-day public comment and review period from **01 October 2021 to 30 October 2021.** The electronic copy of the Draft EIA and EMPr can be downloaded from the Digby Wells website www.digbywells.com (Public Documents), under the data-free service portal.

Specialist Assessments

Various specialist studies were undertaken during the Project evaluation to inform the EIA and EMPr and these include:

- Soils, Land Use and Land Capability Assessment;
- Fauna and Flora Assessment
- Wetlands Assessment;
- Aquatics Assessment;
- Hydropedological Assessment;
- Surface Water Assessment;
- Groundwater Assessment;
- Air Quality Assessment;
- Noise Assessment;
- Heritage Assessment;
- Visual Assessment;
- Traffic Assessment;
- Greenhouse Gas Emissions; and
- Socio-economic Assessment.

Project Alternatives

The location of the Project has been decided by the location of the identified coal resource, therefore, it is not feasible to consider alternative locations.

The alternatives considered in the Scoping Phase and during the pre-feasibility studies undertaken include the mining method, resource access, mining equipment requirements, production and scheduling, employment and the "No-Go" alternative (the option of not proceeding with the Project).

Environmental Impact Assessment Summary

The EIA Report, the associated specialist studies and the PPP were undertaken and completed in line with the legislative requirements discussed in Section 10 (Part A) of this report. A quantitative impact rating methodology was applied to determine the significance of the expected impacts pre-mitigation and post-mitigation. Table A provides a summary of the key impacts (of medium, moderate and major significance only) expected during the various phases of the Project. This report lists and assesses all the potential impacts, together with the associated mitigation measures. All recommendations from the specialist assessments need to be implemented and the requirements of the EMPr must be strictly adhered to.

Table A: Summary of the Key Impacts Associated with the Proposed Activities

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Construction	Access road construction, movement of vehicles, and heavy machinery.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 60	Negligible (negative) - 32
Construction	Site clearing and preparation by the removal of vegetation and topsoil, leading to the exposure of soils for site establishment.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Increased wind and water erosion and consequently sedimentation potential; • Removal of vegetation and basal cover resulting in loss of topsoil, organic material and increased erosion potential; and • Compaction, ponding, and changing the natural landscape of the area.	Moderate (negative) - 84	Negligible (negative) - 30
Construction	Construction of surface infrastructure	Soil, Land Use, and Land Capability	• Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Increased hardened surfaces resulting in increased hydrological functioning; • Diggings, removal, and shifting of soil; • Potential spillage of sewage wastewater and hydrocarbons such as oils, fuels and grease, thus contamination of the soils; and • Increased dust, erosion, and sedimentation.	Moderate (negative) - 84	Negligible (negative) - 30
Construction	• Waste management activities, including: • In-pit RoM Stockpiling; • Handling of hydrocarbon chemicals; • Hauling and transportation of waste material; • Transportation of product coal; and Disposal of waste material	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Soil contamination from sewage and wastewater; and • Soil compaction resulting from the movement of heavy machinery within the Project Area.	Minor (negative) - 66	Negligible (negative) - 29
Construction	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	Minor (negative) -52	Negligible (negative) -32
Construction	Construction of infrastructure, and ventilation Shafts.	Fauna and Flora	• Increased faunal casualties; and • Changes to the landscape, causing ponding and undulating topographies.	Minor (negative) -40	Negligible (negative) -20

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Construction	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	Minor (negative) -44	Negligible (negative) -20
Construction	Stockpiling of soils, rock dump	Fauna and Flora	• Compaction of soils; • Low vegetation growth. If stockpiles unvegetated, potential erosion • Increased run off and erosion.	Minor (negative) -44	Negligible (negative) -24
Construction	Access road construction,	Wetlands	• Erosion and sedimentation; and • Soil compaction and or disturbance.	Minor negative (-60)	Minor negative (-32)
Construction	Site clearing, including the removal of vegetation and disturbance of soils	Wetlands	• No wetlands will directly be impacted, however secondary impacts might occur as activities are proposed within 100 m and 500 m of wetlands. Secondary impacts include: • Erosion and sedimentation; • Loss of fauna and flora (biodiversity); and • Increased AIPs.	Negligible (negative) (-27)	Negligible (negative) (-10)
Construction	Construction of mine related surface infrastructure	Wetlands	• Increased hardened surface, runoff and onset of erosion and sedimentation; • Decreased wetland habitat, functionality and integrity; • Soil, water and wetland contamination.	Minor (negative) (-60)	Negligible (negative) (-33)
Construction	Waste management activities	Wetlands	• Contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland health and biodiversity.	Moderate (negative) – 85	Minor (negative) (-65)
Construction	Site clearance and construction of proposed infrastructure.	Aquatics	• Land and vegetation manipulation/clearing in proximity to the watercourses.	Minor (negative) – 60	Negligible (negative) – 27
Construction	Site preparation including vegetation clearance and excavations, leading to exposure of soils.	Hydropedology	• Siltation and sedimentation of water resources leading to deteriorated water quality.	Minor (negative) - 72	Negligible (negative) -18
Construction	Handling of hydrocarbons and other chemicals; Loading, hauling and transportation of product coal.	Hydropedology	• Contamination of water resources leading to deterioration of water quality.	Minor (negative) - 70	Negligible (negative)-18
Construction	Site preparation and excavations. Stockpiling of spoils and discard.	Surface water	• Sedimentation and siltation of nearby watercourses most likely leading to deteriorated water quality.	Minor (negative)- -40	Negligible (negative) -14
Construction	Washing off, of oils, fuels and other hydrocarbon spills during the construction of facilities such as offices, ablutions, storerooms,	Surface water	• Surface water contamination and deterioration of water quality.	Minor (negative) - 55	Negligible (negative) -12

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
	workshops, storage dams, process plant, roads, pipelines, power lines and conveyors.				
Construction	Site Clearing, Construction of Haul Roads and Surface Infrastructure.	Air Quality	• Reduction in ambient air quality.	Negligible (negative) – 30	Negligible (negative) – 12
Construction	Site/vegetation clearance for site establishment (infrastructure including ventilation fans, change houses, offices, ablutions, and workshops)	Noise	• Noise will emanate from the machinery and vehicles operating during the construction activities.	Negligible (negative) – 18	Negligible (negative) – 12
Construction	In-pit RoM Stockpiling	Noise			
Construction	Access road construction	Noise			
Construction	Power line construction.	Noise	• Noise impacts are considered to be negligible therefore was not assessed further.		
Construction	Construction of infrastructure.	Noise	• Noise emissions from equipment/machinery will increase the noise levels at sensitive receivers but not enough to result in a noise disturbance		
Construction	Removal of vegetation / topsoil for establishment of mining and linear infrastructure	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation. • Potential for dust pollution.	Minor (negative) -49	Negligible (negative) -18
Construction	Construction of infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	Minor (negative) -56	Minor (negative) -42
Construction	Temporary employment creation	Socio-economic	• Temporary economic injection through income, mostly on an individual or household level.	Negligible – (positive) (24)	Minor – (positive) (40)
Construction	Project-induced in-migration	Socio-economic	• A temporary increase in certain segments of the population can place additional strain on housing and services.	Negligible – (negative) (-28)	Negligible (0)
Construction	Surface preparation for infrastructure	Heritage	• Direct negative impacts to BGG-001	Major (negative) (-126)	Moderate (positive) + (72)
Construction	Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.	Minor (negative) -49	Negligible (negative) -18
Construction	Construction of Infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	Minor (negative) -56	Moderate (negative) -42

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Blasting (only when dikes and other geological features are encountered).	Soil, Land Use, and Land Capability	• Movement of the soil strata; and • Potential subsistence, causing ponding and undulating topographies	Moderate (negative) - 60	Negligible (negative) - 32
Operational	Underground mining machinery maintenance.	Soil, Land Use, and Land Capability	• Soil Contamination; and • Soil compaction.	Minor (negative) - 66	Negligible (negative) - 28
Operational	Use of existing haul roads and vehicle movement.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 65	Negligible (negative) - 32
Operational	In-pit ROM Stockpiling.	Soil, Land Use, and Land Capability	• Soil Contamination from ROM stockpiles, leaching, erosion, sedimentation of contaminants; • Loss of vegetation and habitat due to high contaminates in soils; and • Erosion and sedimentation from ROM Stockpiling areas.	Moderate (negative) - 66	Minor (negative) - 36
Operational	Operation of water and sewer reticulation. Waste management activities.	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); and • Soil contamination from sewage and wastewater	Moderate (negative) - 66	Negligible (negative) - 32
Operational	Operation of the coal discard processing plant.	Soil, Land Use, and Land Capability	• Contamination of soil; • Increased runoff; and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 78	Minor (negative) - 36
Operational	Underground blasting and operation of the underground workings.	Fauna and Flora	• Subsidence of areas that have been destabilised by underground workings; • Potential contamination of underground water and air; and • Increased risk of erosion.	Minor (negative) -52	Minor (negative) -44

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas	Fauna and Flora	• Habitat disturbances and increased soil erosion, soil contamination and compaction. • Increased faunal casualties (roadkill); • Increased erosion and sedimentation decreasing vegetation cover; • Dust pollution, and AIP proliferation; • Ensure maintenance of infrastructure to prevent any spillages thus preventing contamination of the soil; • Increased vehicle movement in the area, increasing soil compaction, and runoff potential; and • Unexpected changes in the topography and overall habitats.	Minor (negative) -40	Negligible (negative) -20
Operational	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	Minor (negative) -44	Negligible (negative) -20
Operational	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	Minor (negative) -52	Negligible (negative) -32
Operational	Blasting (only when dikes and other geological features are encountered).	Wetlands	• Movement of the strata causing potential subsistence, resulting in ponding and undulating topographies; and • Dewatering and drying out of wetlands.	Major (negative) (-119)	Moderate (negative) (-90)
Operational	Underground mining machinery maintenance.	Wetlands	• Contamination and deterioration of soil and water quality and quantity; and • Loss or changes to natural wetland PES, ES and EIS.	Moderate (negative) – 75	Minor (negative) – 48
Operational	Use of existing haul roads and vehicle movement.	Wetlands	• Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential into wetlands; • Loss of vegetation and habitat; and • Wetland fragmentation.	Minor (negative) (-65)	Minor (Negative) (-40)
Operational	In-pit ROM Stockpiling.	Wetlands	• Potential runoff from topsoil and subsoil stockpiles causing sedimentation into the wetlands; • Erosion and sedimentation of contaminants into the wetland areas.	Minor (negative) (-56)	Negligible (negative) (-30)
Operational	Operation of water and sewer reticulation. Waste management activities.	Wetlands	• Contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland integrity and biodiversity.	Moderate (negative) (-75)	Minor (negative) (-44)

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Operation of the coal discard processing plant.	Wetlands	• Contamination of soil, water and wetlands; • Loss of wetland health and biodiversity; and • Loss of wetland functionality.	Moderate (negative) (-96)	Minor (negative) (-65)
Operational	Uncontrolled runoff of stormwater or process water from or through the surface infrastructure	Aquatics	• Water quality and habitat deterioration of watercourses receiving unnatural/contaminated runoff.	Minor (negative) – 65	Negligible (negative) – 21
Operational	Runoff from the dirty water areas or catchments (coal stockpile areas, mine processing plant, workshops etc.).	Hydropedolo gy	• Surface water contamination and deterioration of water quality on the natural water resources.	Moderate (negative) -60	Negligible (negative) -18
Operational	Hydrocarbons and chemicals spillages and leakages from equipment, moving haulage trucks and machinery.	Hydropedolo gy	• Water contamination by hydrocarbon waste and deterioration of water quality through runoff and potential groundwater contamination where leaks and spillages occur within recharge soils.	Minor (negative) - 72	Negligible (negative) -18
Operational	Hydrocarbon and chemical spillages and leakages from equipment, moving vehicles and machinery during mining, processing, loading and hauling of the product coal.	Surface water	• Surface water contamination by hydrocarbon waste and deterioration of surface water quality	Minor (negative) - 48	Negligible (negative) -27
Operational	Runoff from contaminated areas such as Waste Rock Dumps (WRDs), STP and discard processing plant may pollute nearby surface water resources.	Surface water	• Surface water contamination by runoff from dirty areas and deterioration of surface water quality.	Minor (negative) - 70	Negligible (negative) -32
Operational	Active mine dewatering will be required to ensure dry working conditions in the open pits and underground mining areas. The dewatering will cause ground levels to be drawn down in the vicinity of the mining area.	Groundwater	• Mine dewatering causing lowering of groundwater levels	Minor (negative) - 42	Minor (negative) - 39
Operational	Mine dewatering causing a decrease in groundwater reserves	Groundwater	• Due to active mine dewatering required to ensure dry working conditions in the open pits and underground voids, certain groundwater volumes will be extracted from the open pits and underground mining areas, limiting the groundwater resource.	Minor (negative) - 36	Negligible (negative) -33
Operational	AMD formation in pits, underground voids and co-disposal facility; other surface sources that could cause groundwater contamination.	Groundwater	• Due to AMD formation in the mining areas and co-disposal facility, or any seepage from infrastructures, the groundwater quality could be impacted upon.	Negligible (negative) -22	Negligible (negative) -18
Operational	Establishment of Open Underground Mine, Ventilation Shaft, In-pit Stockpiling and Operation of the Discard Plant.	Air Quality	• Dust generation and reduction in ambient air quality.	Major (negative) – 78	Negligible (negative) – 36
Operational	Mining of coal by underground mining	Noise			

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Blasting (only when dikes and other geological features are encountered)	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.	Negligible (negative) – 27	Negligible (negative) – 24
Operational	In-pit ROM Stockpiling	Noise	• Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.		
Operational	Diesel storage and explosive magazine	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.		
Operational	Underground Mining Machinery Maintenance	Noise	• Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.		
Operational	Operation of water and sewer reticulation	Noise			
Operational	Use of existing haul roads	Noise			
Operational	Long term employment creation	Socio-economic	• Extended employment periods at the mine through the extension of the LoM.	Minor – (positive) (36)	Minor – (positive) (55)
Operational	Project-induced in-migration	Socio-economic	• An increase in certain segments of the population can place additional strain on housing and services.	Minor – (negative) (-40)	Negligible – (negative) (-24)
Operational	Skills training	Socio-economic	• As per the requirements of the SLP, the workforce and some of the local community will be upskilled in line with the mine's skills development plan.	Minor – (positive) (70)	Moderate – (positive) (77)
Operational	Social investment in local communities	Socio-economic	• The mine is currently implementing mine community development projects and will continue to do so under this project that extends the LoM and the mine's SLP commitments.	Minor – (positive) (52)	Minor – (positive) (70)
Operational	Multiplier effects on the local and regional economy	Socio-economic	• Through the expansion of the DEMC, direct and multiplier effects will continue for a further 14 years.	Minor – (positive) (44)	Moderate – (positive) (96)
Operational	Continuation in nuisance factors	Socio-economic	• The extended LoM implies an extension and intensification of certain nuisance factors such as blasting, resulting in continued noise and dust pollution and other issues.	Minor - (negative) (-55)	Minor - (negative) (-45)
Operational	Continued competition over water resources	Socio-economic	• Water is a scarce resource, and the expansion of the mine could further impact on this limited resource.	Minor - (negative) (-60)	Negligible - (negative) (-33)
Operational	Community health, safety, and security	Socio-economic	• Continuation and expansion of mining activities will lead to a possible increase and continuation of impacts associated with community health, safety, and security.	Minor - (negative) (-65)	Negligible - (negative) (-30)
Operational	Operation of surface infrastructure (discard wash plant, workshop area, and related infrastructure)	Visual	• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.	Moderate (negative) -84	Minor (negative) -60

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Lighting of mine infrastructure at night	Visual	• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.	Negligible (negative) - 32	Slightly Detrimental -24
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Soil, Land Use, and Land Capability	• Compaction of soil; • Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology; and • The proliferation of AIPs, changing the soil biodiversity, and potential.	Minor (negative) - 50	Negligible (negative) - 32
Closure	Demolition of infrastructure and rehabilitation of affected areas.	Soil, Land Use, and Land Capability	• Disturbance of soils and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; and • Ponding of water and creation of drainage channels.	Minor (negative) - 65	Negligible (negative) - 24
Closure	Post-closure monitoring and rehabilitation.	Soil, Land Use, and Land Capability	• Minimal negative impacts on the environment; • AIPs Monitoring Plan; and • Soil compaction and increased runoff potential due to vehicle movement during rehabilitation programs.	Minor (negative) - 55	Moderate (Positive) 91
Closure	Demolition and removal of infrastructure	Fauna and Flora	• Disturbance of soils, and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape.	Minor (negative) -44	Negligible(negative) -24
Closure	Post-closure monitoring and rehabilitation	Fauna and Flora	• Minimal negative impacts on the environment; • Activities involve the rehabilitation processes of reprofiling the soils and re-vegetation thereafter; • Impacts include the possibility of erosion and sedimentation; • Proliferation of AIPs; and • Change in the habitat and species composition.	Minor (negative) -50	Positive Impact (positive) 66
Closure	Closure of the underground mine.	Fauna and Flora	• Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats; and • Change in the land topography and species composition.	Minor (negative) -56	Negligible (negative) -33

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Wetlands	• Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology of the wetlands; and • The proliferation of AIPs. • Exposure of soils and subsequent compaction, erosion, and sedimentation into the wetlands; • Deterioration of water quality; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of wetlands.	Minor (negative) (-78)	Minor (negative) (-36)
Closure	Post-closure monitoring and rehabilitation.	Wetlands	• Onset of erosion and sedimentation; and • AIPs proliferation.	Negligible (negative) (-32)	Negligible (negative) (-10)
Closure	Post-mining decants into wetlands and streams	Wetlands	• Water, soil and wetland contamination; • Decreased PES, ES and EIS; and • Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use.	Major (negative) – 119	Moderate (negative) (– 105)
Closure	Seepage and runoff of contaminated water entering aquatic ecosystems.	Aquatics	• Water quality deterioration of watercourses in contact with contaminated water resulting in AMD.	Minor (negative) – 108	Negligible (negative) – 15
Closure	Demolition of mine infrastructure (PCDs, workshops, haul roads, processing plant etc.) Disturbance of soils and erosion by overland flow.	Hydropedology	• Sedimentation and siltation of nearby watercourses and deterioration of water quality.	Moderate (negative) -84	Negligible (negative) -18
Closure	Rehabilitation of disturbed sites close to pre-mining conditions.	Hydropedology	• Restoration of pre-mining streamflow regime in nearby watercourses.	Moderate (positive) +90	No possible mitigation
Closure	Potential risk of subsidence.	Hydropedology	• The mined-out areas may be prone to subsidence.	Moderate (negative) -96	Minor (negative) -40
Closure	Disturbance of soils during removal of infrastructure at closure	Surface water	• In-stream water quality and quantity deterioration from sedimentation and siltation.	Minor (negative) -60	Negligible (negative) 24
Closure	Spillages of hydrocarbons (oils, fuels and grease) by vehicles and machinery used during demolition and transportation of material from decommissioned infrastructure	Surface water	• Surface water contamination due to hydrocarbon waste spillages.	Moderate (negative) -96	Minor (negative) -40
Closure	Reaction of sulphide compounds in extracted coal residues with water and oxygen, causing Acid Mine Drainage (AMD) and decant to low-lying areas.	Surface water	• Contamination of soil and water resources from potential decant of AMD and movement of contamination plumes due to the re-watering of the backfilled pit.	Moderate (negative) -96	Minor (negative) -40

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Mine Dewatering and residual effect on rebounding groundwater levels.	Groundwater	• Due to the dewatering activities during the operational phase, groundwater levels surrounding the mining areas will be subdued at the start of the Post Closure Phase, after it will gradually recover towards pre-mining levels.	Minor (negative) -42	Minor (negative) - 39
Closure	AMD formation in open pits, underground voids and co-disposal facility.	Groundwater	• Due to AMD taking place within the backfilled open pits and in co-disposal facility, groundwater contamination with elevated sulphate and low pH could occur.	Moderate (negative) -90	Minor (negative) - 60
Closure	Mine decant causing contamination of groundwater.	Groundwater	• If groundwater levels within the open pits recover to elevations higher than surface elevations, this water may then flow from the pit areas and cause groundwater contamination down gradient of the mine.	Moderate (negative) -84	Minor (negative) - 42
Closure	Demolition and Removal of Infrastructure and Rehabilitation.	Air Quality	• Dust generation and reduction in ambient air quality.	Major (negative) – 42	Negligible (negative) – 20
Closure	Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation.	Noise	• The demolition equipment/machinery will generate noise leading to an increase in noise levels onsite and at sensitive receivers; and • However, the removal of noise generating sources will lead to a reduction in the noise levels.	Negligible (negative) – 18	Negligible (negative) – 12
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Noise	• Noise impacts are considered to be negligible therefore will not be assessed further.		
Closure	Post-closure monitoring and rehabilitation.	Noise			
Closure	Post-closure monitoring and rehabilitation.	Socio-economic	• Economic Contraction	Moderate - negative (-90)	Minor - negative (-60)
Post Closure	Seepage and runoff of contaminated water entering aquatic ecosystems	Aquatics	• Water quality deterioration of watercourses in contact with contaminated water resulting in AMD	Minor (negative) – 108	Negligible (negative) – 15

Conclusions and Recommendations

The environmental impacts associated with the proposed Project can be mitigated and avoided to a large extent by implementing the recommended mitigation measures. The Project is anticipated to positively impact the local and national socio-economic environment and should be approved, provided that the recommendations from the EAP and all regulatory requirements are adhered to. The most significant impacts to the environment relate to surface water, aquatics, groundwater, as well as fauna and flora.

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Appendix U: Historical Authorisations for the DECM

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LIST OF PLANS

ACRONYMS AND ABBREVIATIONS

AIP	Alien Invasive Plant
AMD	Acid Mine Drainage
AQIA	Air Quality Impact Assessment
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBAs	Critical Biodiversity Areas
CALLM	Chief Albert Luthuli Local Municipality
CEC	Cation Exchange Capacity

CRR	Comments and Response Report
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
Digby Wells	Digby Wells Environmental
DMRE	Department of Mineral Resources and Energy
DECM	Dorstfontein East Coal Mine
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance And Sensitivity
EMPr	Environmental Management Programme
ECC	Exxaro Coal Central (Pty) Ltd
GSDM	Gert Sibanda District Municipality
Ha	Hectares
HIA	Heritage Impact Assessment
HRAs	Heritage Resources Authorities
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFA	Infrastructure Footprint Area
IHAS	Integrated Habitat Assessment System
IUCN	International Union for the Conservation of Nature
IWUL	Integrated Water Use License
IWULA	Integrated Water Use Licence Application
Km	Kilometres
km^2	Square kilometres
kV	Kilovolt
kWh	kilowatt-hour
LED	Local Economic Development
LoM	Life of Mine
m	Metres

m/s	Metres per second
mamsl	Metres above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	Metres below ground level
MIRAI	Macroinvertebrate Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 Of 2002)
MR	Mining Right
MRA	Mining Right Application
Mtpa	million tonnes per annum
NCRs	National Noise Control Regulations
NEMA	National Environmental Management Act, 1998 (Act No. 107 Of 1998)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 Of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 Of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEM: PAA	National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003)
NFEPA	National Freshwater Ecosystem Priority Areas
NGOs	Non-Governmental Organisations
NHRA	National Heritage Resources Act, 1999 (Act No. 25 Of 1999)
NDM	Nkangala District Municipality
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PCD	Pollution Control Dam
PES	Present Ecological Status
POIs	Points of Interests
RCP	Rehabilitation and Closure Plan
RE	Remaining Extent
ROM	Run of Mine
S&EIR	Scoping and Environmental Impact Reporting

SAAELIP	South African Atmospheric Emission Licensing & Inventory Portal
SAHRA	South African Heritage Resources Agency
SAMRAD	South African Mineral Resources Administration System
SANAS	South African National Accreditation System
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SASS	South African Scoring System
SAWQG	South African Water Quality Guidelines
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
SLP	Social and Labour Plan
SOP	Standard Operating Procedure
SSC	Species of Special Concern
STLM	Steve Tshwete Local Municipality
STP	Sewage Treatment Plant
SWMP	Stormwater Management Plan
TIA	Traffic Impact Assessment
TMP	Topsoil Management Plan
TOPS	Threatened or Protected Species
TSP	Total Suspended Particulate
UNFCCC	United Nations Framework Convention on Climate Change
VIA	Visual Impact Assessment
Vu	Vulnerable
WML	Waste Management Licence
WTP	Water Treatment Plant
WUL	Water Use Licence
WULA	Water Use Licence Application

Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Exxaro Coal Central (Pty) Ltd (ECC) holds an approved Mining Right (MR) (Ref. No. **MP 30/5/1/2/2/51 MR)** for opencast and underground mining at the Dorstfontein East Coal Mine (DECM) situated in Kriel, Mpumalanga Province. DECM was previously owned by Total Coal South Africa (Pty) Ltd (Total) and was ceded to ECC on 20 August 2015. The current proposal aims to extend underground mining in the approved mining area and introduce ancillary surface infrastructure to support this.

DECM has approval to mine the Lower 4 Seam and the Lower 2 Seam and is also authorised to mine three open pits. The operation have approved Environmental Impact Assessments (EIA) and Environmental Management Programmes (EMPr) dated August 2009 (GCS) and October 2017 (SRK Consulting) for Dorstfontein East Mine and Dorstfontein East Pit 1 Extension.

An application for Environmental Authorisation (EA) for this Project was submitted to the Department of Mineral Resources and Energy (DMRE) on 13 November 2020 (Ref. No. MP30/5/1/2/2/51MR**)**. The final Scoping Report (SR) was submitted to the DMRE on 26 January 2021 and was accepted on 28 May 2021 with (Ref. No. **30/5/1/1/2/3/1/51)**.

This report is the Draft EIA and EMPr for the Project and integrates, amongst others, all the findings of specialist studies; impacts and mitigation measures; and aligns existing EMPrs for the DECM.

An alignment of all EMPrs will ensure that DECM incorporates all current and future proposed activities associated for the DECM operation into a single management document. The following EMPrs require alignment into one operational EMPr for the DECM operations:

- EMPr for Mining Right [Ref. No. MP 30/5/1/2/2/51MR] (April 2008);
- EMPr Amendment for Mining Right [Ref. No. MP 30/5/1/2/2/51MR] (August 2009); and
- EIA/EMPr for the Dorstfontein East Mine Extension of Pit 1 and Water Transportation Pipeline from Dorstfontein West to Dorstfontein East [Ref No. MP 30/5/1/2/3/2/1 (51) MR] (SRK, October 2017).

The proposed expansion of the underground mining operation and introduction of ancillary infrastructure triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 04 December 2014, as amended) (EIA Regulations, 2014) as promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), requiring that a Scoping and EIA Process be undertaken to obtain an EA.

Due to the extensive environmental on-site investigations that was required for this project, the Applicant applied to extend the submission deadline of the final EIA/EMPr and this extension has not yet been approved by the DMRE.

Furthermore, a Water Use Licence Application (WULA) in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) is required to lawfully undertake the proposed mining activities.

This application focuses on the inclusion of the extension of underground mining areas for both 4 Seam and 2 Seam. The goal of this process is therefore to include the extension areas and ultimately align the EMPrs associated with the DECM into one report.

2 Project applicant

ECC is the applicant and the details of the applicant are presented in Table 2-1.

Table 2-1: Contact details of the Applicant

Name of Applicant:	Exxaro Coal Mpumalanga (Pty) Limited
Registration number (if any):	1999/010289/07
Trading name (if any):	N/A
Responsible person: ***(E.g. CEO, Director, etc.)***	Group Manager: Environment, Mining Licensing and Sustainability
Contact person:	Mr Tsheko Ratsheko
Physical address:	The Connexxion, 263B, West Avenue, Die Hoewes, Centurion
Postal address:	The Connexxion, 263B, West Avenue, Die Hoewes, Centurion
Postal code:	0163
Telephone:	+27 (0) 12 307 3000
Email:	Tsheko.Ratsheko@exxaro.com

2.1 Details of the Environmental Assessment Practitioner

Digby Wells has been appointed to undertake the EA Application and the Integrated Water Use Licence Application (IWULA) processes, as well as the associated specialist studies; the required Public Participation Process (PPP); and EMPr alignment. The details of the Environmental Assessment Practitioner (EAP) are contained in Table 2-2 below.

Table 2-2: Contact Details of the EAP

Company Name:	Digby Wells and Associates (South Africa) (Pty) Ltd
Name of Practitioner:	Kelly Tucker
Telephone:	+27 11 789 9495
Fax:	+27 11 789 9498
Email:	Kelly.Tucker@digbywells.com

2.2 Expertise of the Environmental Assessment Practitioner

This section provides details regarding the EAP's qualifications and experience. The EAP's Curriculum Vitae (CV) and qualifications are attached as Appendix A of this report.

2.2.1 Summary of the EAP's Past Experience

Kelly Tucker has 15 years' experience in environmental management and consulting industry. The projects she has supported and been responsible for range from mining and resources, energy generation and transmission. Kelly earned an MSc in Environmental Management and a Diploma in project management. She has managed Environmental and Social Impact Assessment (ESIA) projects that required compliance with local legislative requirements and International Finance Corporation (IFC) Guidelines, World Bank guidelines and Equator Principles.

3 Existing Activities

DECM is currently mining the 4 Seam and 2 Seam of the coal reserves. However, where thicker than 1 m, the 5, 3 and 1 Seams are also extracted. Mining activities use a truck-and-shovel method to expose and extract coal. The Life of Mine (LoM) entails the introduction of underground extraction of Lower 4 Seam through an adit from one of its pit's highwalls.

3.1 Current Operational Structure of DECM Operations

The DECM holds 2 066 ha of coal rights and 1 230 ha of surface rights, which make up the DECM Operations. Current mining activities are being undertaken on the farms, Dorstfontein 71 IS, Boschkrans 53 IS, Fentonia 54 IS, and Welstand 55 IS. Operations at DECM comprise of the opencast and underground mining activities (the "Current Activities"), as described in the section below.

3.1.1 Opencast Mining Operation

Dorstfontein East is currently mining one opencast Pit (Pit 1). The opencast production rate has been determined at a constant rate of 3 Million tonnes per annum (Mtpa) of Run of Mine (RoM) equating to an overall coal extraction of 21 Million tons (Mt) 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 underground workings.

3.1.2 Underground Mining Operations

The underground mining areas comprise a main block and a satellite block. The main block has been separated into two areas termed Block A and B, and the satellite block has been termed Block C. Only the 4 Seam and 2 Seam have been considered in the underground mining areas.

The coal seams under consideration are relatively free of sandstone and/or shale partings and hence continuous mining operations have been considered in all production sections. In the area where both 4 Upper and 4 Lower Seams are to mined simultaneously, assuming this area will be mined by underground mining methods, the 0.3 m parting between the two seams is not considered a hindrance to continuous mining methods.

3.1.3 Existing Infrastructure

The existing mine infrastructure within the DECM includes the following:

- Opencast workings (Pit 1);
- Underground workings (Block A, B and C);
- Processing plant;
- Co-disposal facility;
- Pollution Control Dams (PCDs);
- Stockpiles (topsoil and overburden);
- Haul roads;
- Stormwater control trenches;
- Dewatering infrastructure;
- Conveyors;
- Substation and powerlines;
- Bulk water supply;
- Water pipelines;
- Sewage Treatment Plant (STP);
- Water Treatment Plant
- Railway line; and
- Plant offices, change rooms, store rooms and workshops and other ancillary infrastructure.

3.2 Historical Authorisations for the DECM

DECM is in possession of the environmental-related authorisations for opencast and underground mining and related activities, as listed in Appendix U

Table 3-1: Current DECM Authorisations

Authorisation	Reference
EA for listed activities in terms of the NEMA associated with diesel storage tanks (EA Ref. No. 17/2/3 N-19) issued on 19	Appendix U

Authorisation	Reference
May 2011 by the Mpumalanga Department of Economic Development, Environment and Tourism.	
Amendment Licence in terms of Section 50 and 158 of the NWA for the Dorstfontein Coal Mine East Expansion, dated September 2019.	
EA for listed activities in terms of the NEMA associated with the Pit 1 Extension and Water Transportation Pipeline Project dated 2017 (Ref. No. MP 30/5/1/2/3/2/1 (51) (EM)) issued by the Mpumalanga Department of Mineral Resources, 3 September 2017.	
(EA for construction of a conveyor and railway loop (Ref. No. 17/2/2/2 NK-7) issued on 9 November 2009 by the Mpumalanga Department of Agriculture and Land Management.	
Integrated Water Use Licence (IWUL) for the water use related activities in terms of the NWA dated September 2019 (Licence no. 06/B11B/ACIJ/9138).	

4 Location of the Overall Activity

DECM is situated near the town of Kriel within the Magisterial District of Bethal, under the jurisdiction of the Emalahleni Local Council, Mpumalanga Province. The current operation lies directly north-east of the town of Ga-Nala (Kriel).

Table 4-1 contains the details of the farm portions included in the EA application, the municipal district and nearest town to the site (refer to Figure 4-2 and Figure 4-3). The land tenure map is depicted in Figure 4-1. All plans are also provided in Appendix B.

Table 4-1: Property Description

	Farm Name	Farm Portion	Area (ha)
Farm Name:	Bosch Krans 53 IS	12/53	311.83
	Dorstfontein 71 IS	8/71	207.24
	Dorstfontein 71 IS	2/71	664.68
	Fentonia 54 IS	2/54	227.93
	Fentonia 54 IS	3/54	331.16
	Fentonia 54 IS	1/54	272.81
	Welstand 55 IS	4/55	359.58
	Welstand 55 IS	10/55	5.22
	Welstand 55 IS	11/55	83.22
	Welstand 55 IS	13/55	157.60

	Welstand 55 IS	5/55	231.99
Application Area (Ha):	3 288.53 ha (surface area)		
Magisterial District:	Nkangala District Municipality		
Distance and direction from nearest town:	16 km north east of the town of Kriel.		
21-digit Surveyor General Code for each farm portion:	T0IS00000000005300012 T0IS00000000007100008 T0IS00000000007100002 T0IS00000000005400002 T0IS00000000005400003 T0IS00000000005400001 T0IS00000000005500004 T0IS00000000005500010 T0IS00000000005500011 T0IS00000000005500013 T0IS00000000005500005		

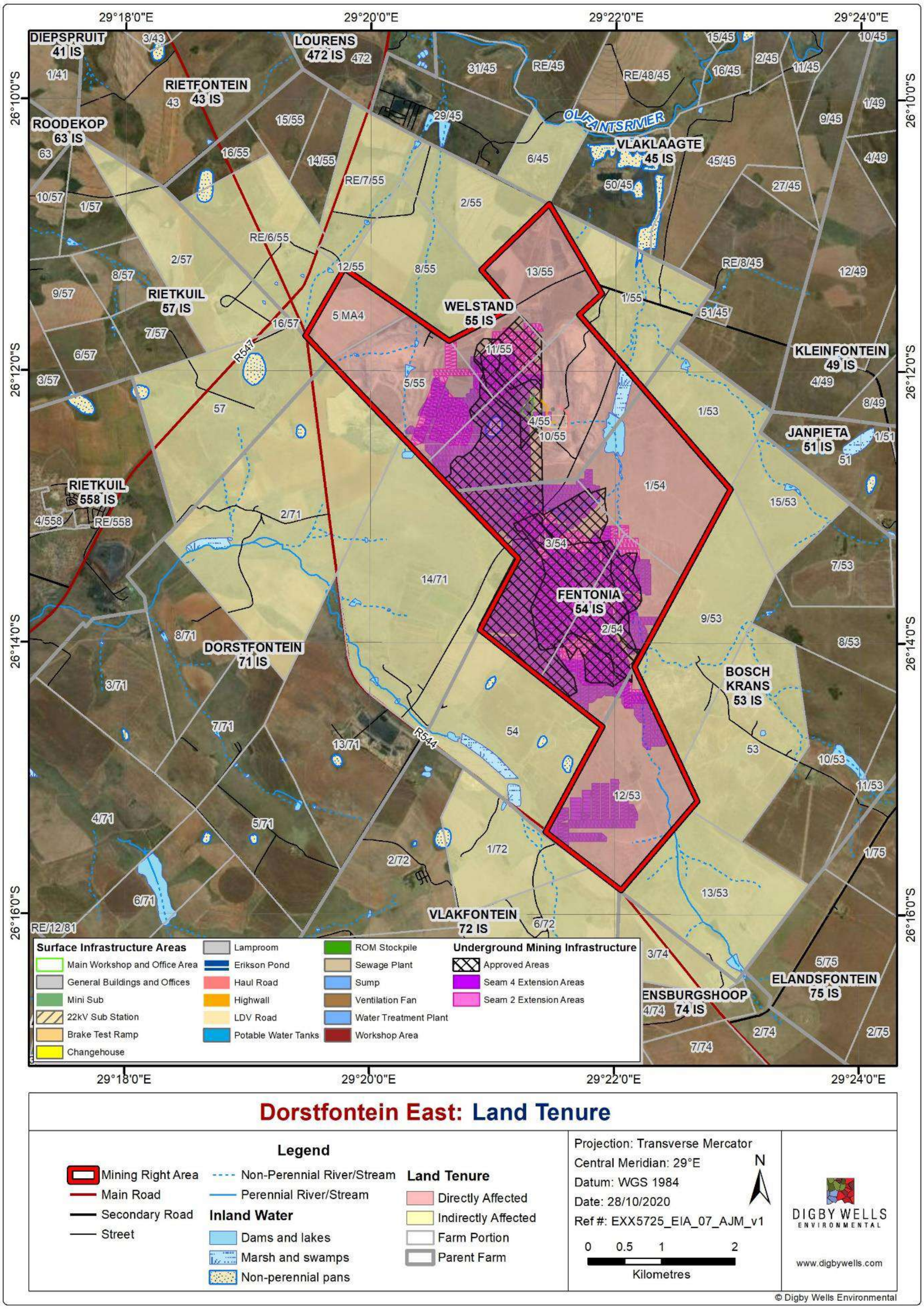


Figure 4-1: Land Tenure Map

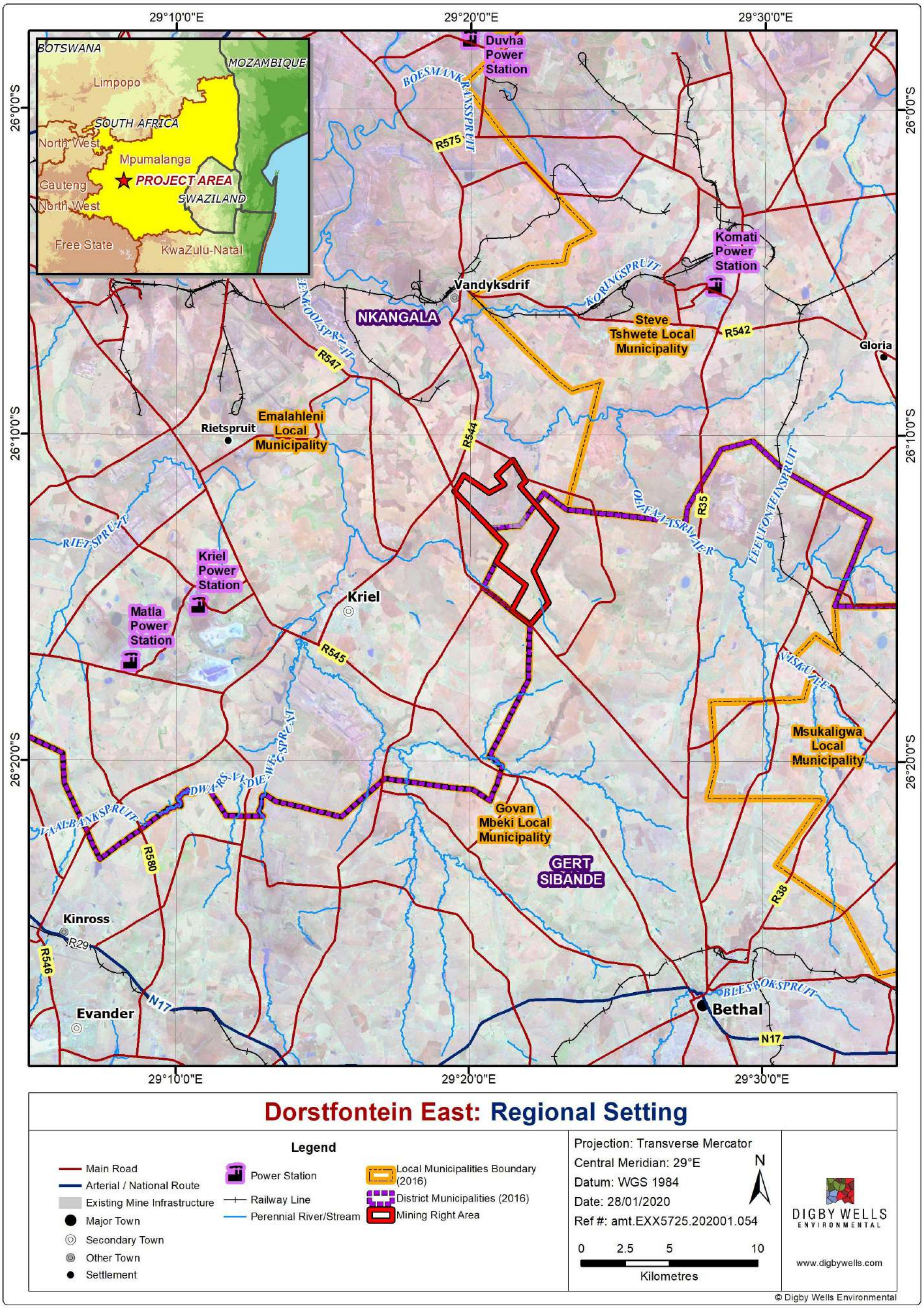


Figure 4-2: Regional Setting of the DECM

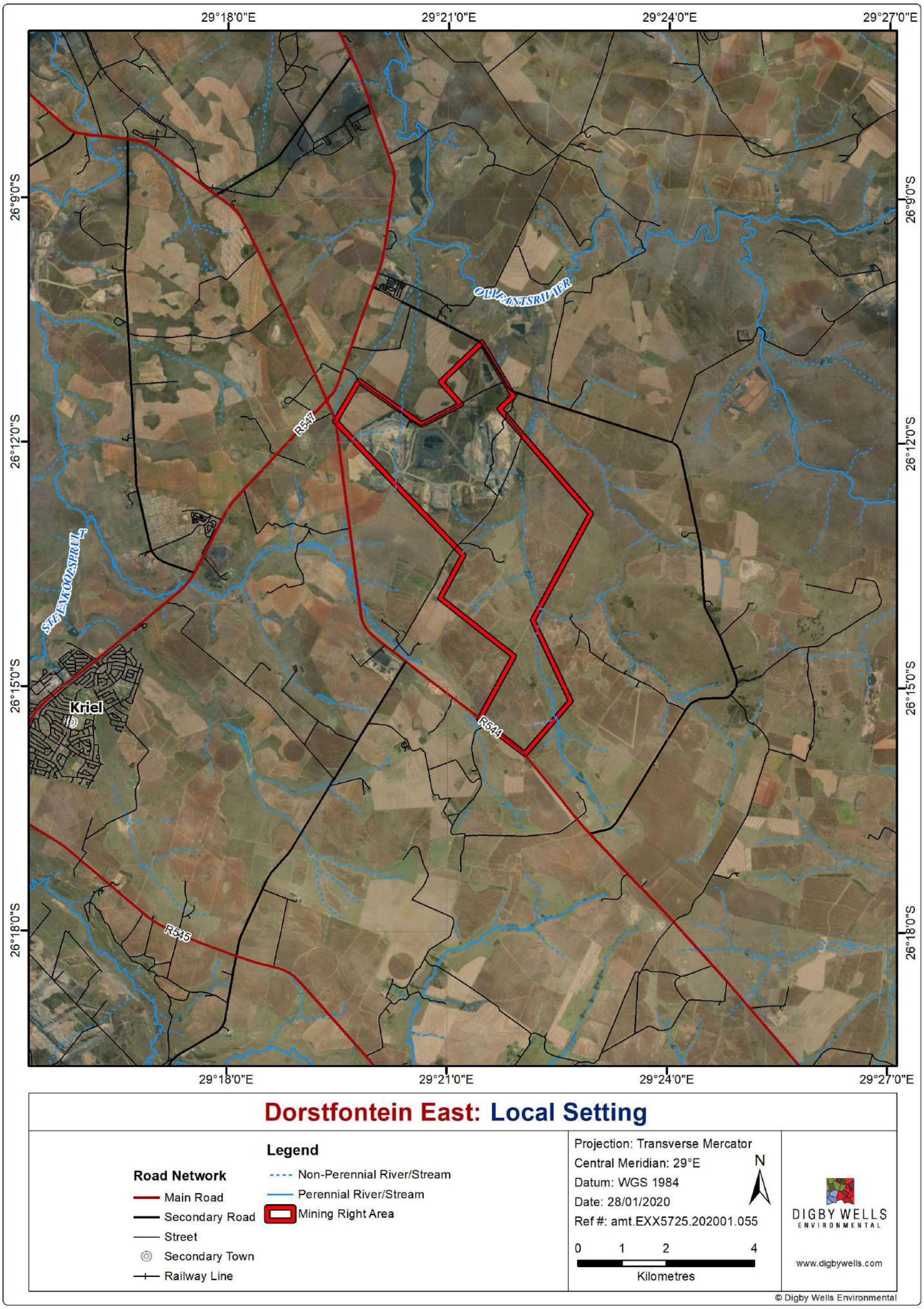


Figure 4-3: Local Setting of the DECM

5 Project Description

This section provides a description of the Project in terms of the activities to be undertaken; and specifically, the Listed Activities that are triggered in terms of the EIA Regulations, 2014 (as amended).

5.1 Description of the Scope of the Proposed Overall Activity

The Project aims to expand the DECM's underground mining area within the existing MR Area (Ref. No. MP30/5/1/2/2/51MR). DECM was previously owned by Total Coal South Africa (Pty) Ltd (Total) and was ceded to ECC on 6 December 2006 which have approved EMPr dated August 2009 (GCS) and October 2017 (SRK Consulting). ECC is now applying to expand the underground mining areas as approved under Total. Subsequently, additional coal reserves have been identified for mining which are not covered under the existing approval. ECC is also approved to undertake underground mining of deeper coal reserves at DECM. The underground mining operations will be accessed from the existing Pit 2 opencast and Dorstfontein West operations. DECM therefore intends to further extend the LoM through the exploitation of these identified additional coal reserves between 2021 until 2034 (14 years).

A portion of the 4 Seam underground extension area situated in the southwest portion of the DECM MR boundary (Figure 5-3) will also be mined. This portion will be accessed from the Dorstfontein West operations. The required infrastructure proposed for the extension includes:

- STP;
- Water Treatment Plant (WTP);
- Potable water storage tank;
- Erikson Dam;
- A new 22 kV overhead powerline from the existing substation to a new kV substation;
- RoM stockpile conveyor at portal;
- Portal ventilation fan;
- Sewage Plant and Water Infrastructure;
- Change house;
- Lamp room;
- Office;
- Workshop area; and
- Stone dust silo.

The surface infrastructure layout plan provided as Figure 5-1 depicts the ancillary infrastructure required to support the underground mining expansion. Figure 5-2 and Figure

5-3 show the already approved underground mining areas and the proposed extent of the extensions. These plans are also attached as Appendix B for reference.

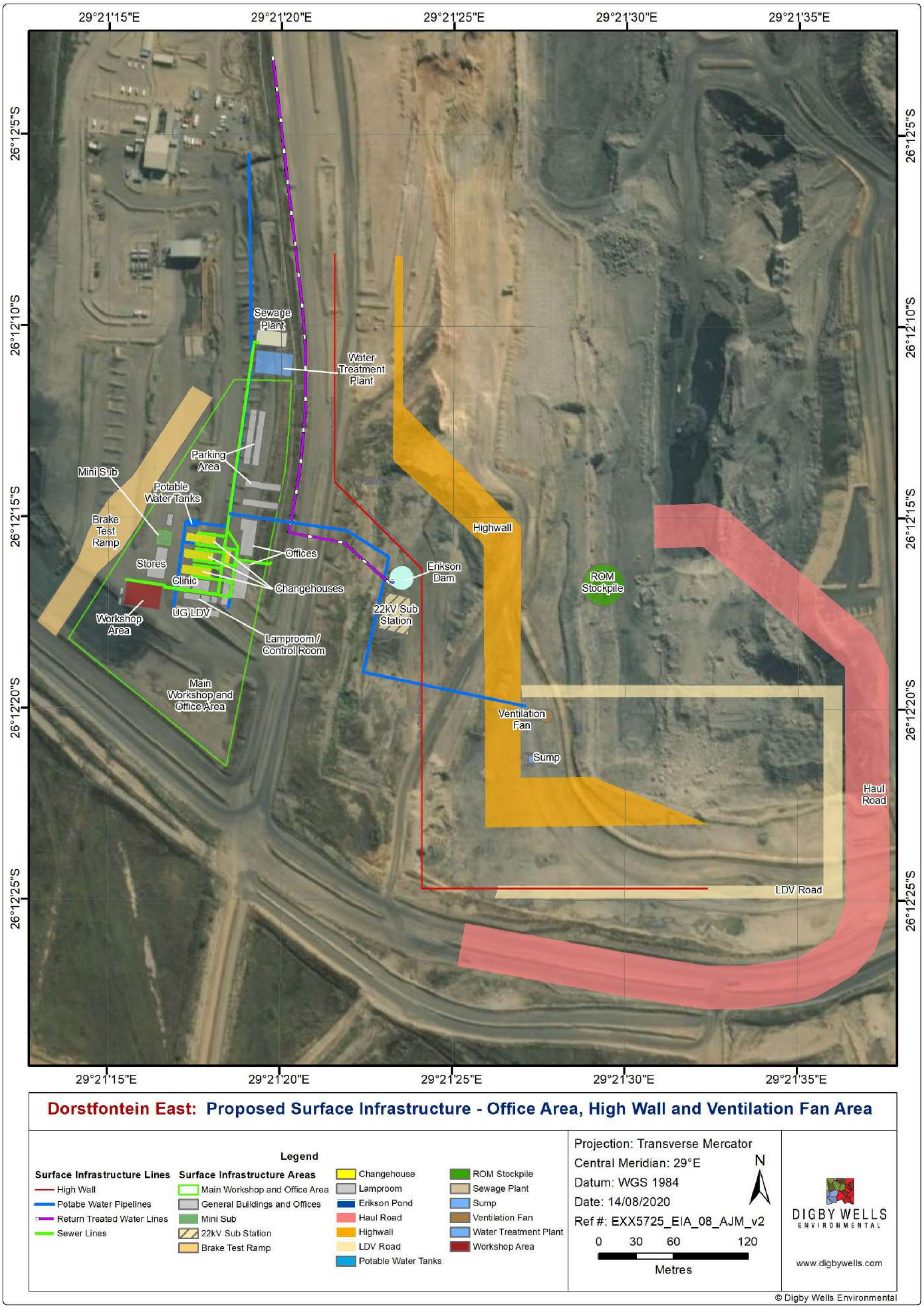


Figure 5-1: Surface Infrastructure Layout

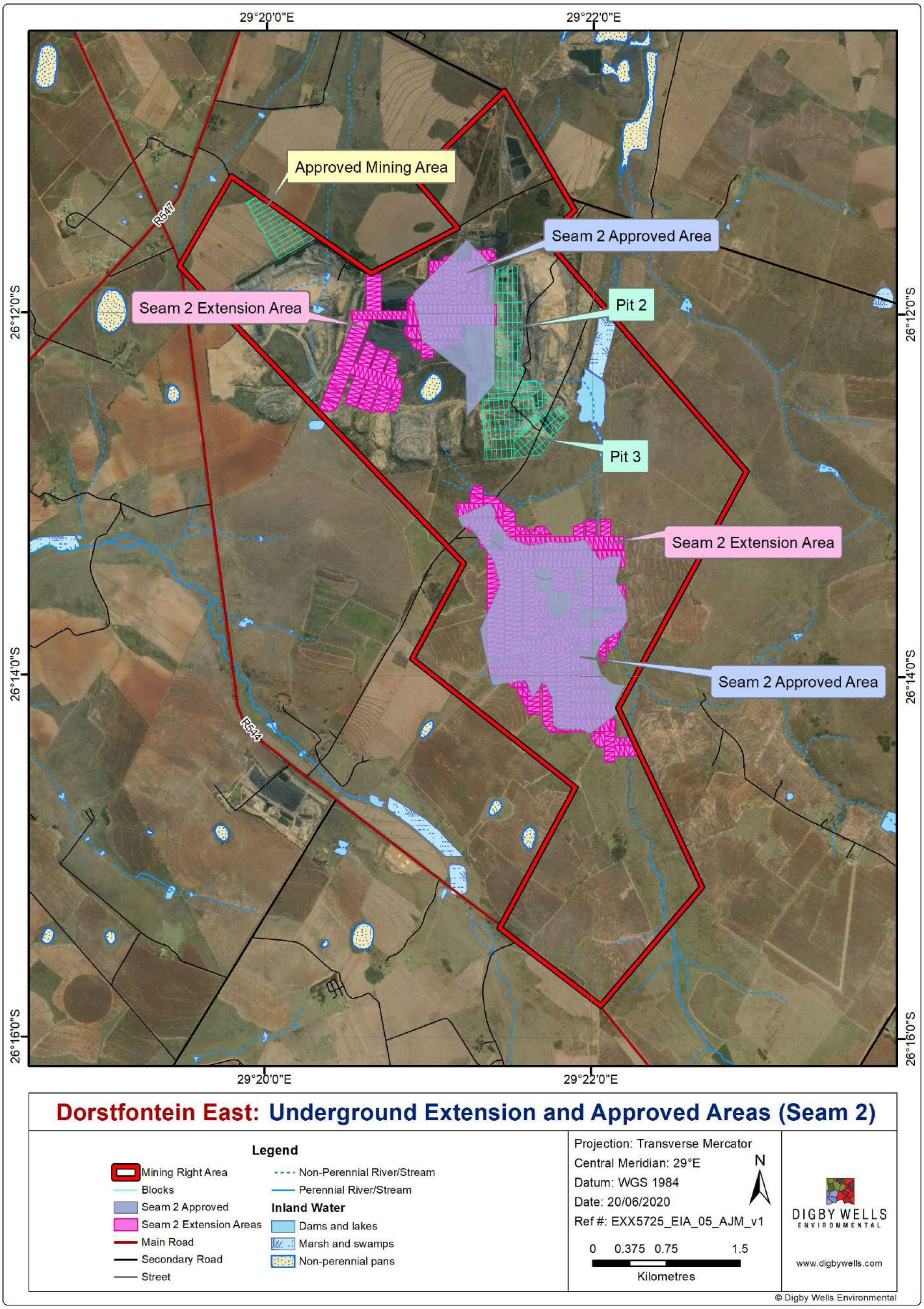


Figure 5-2: Existing Approved and Underground Extension Areas in Seam 2

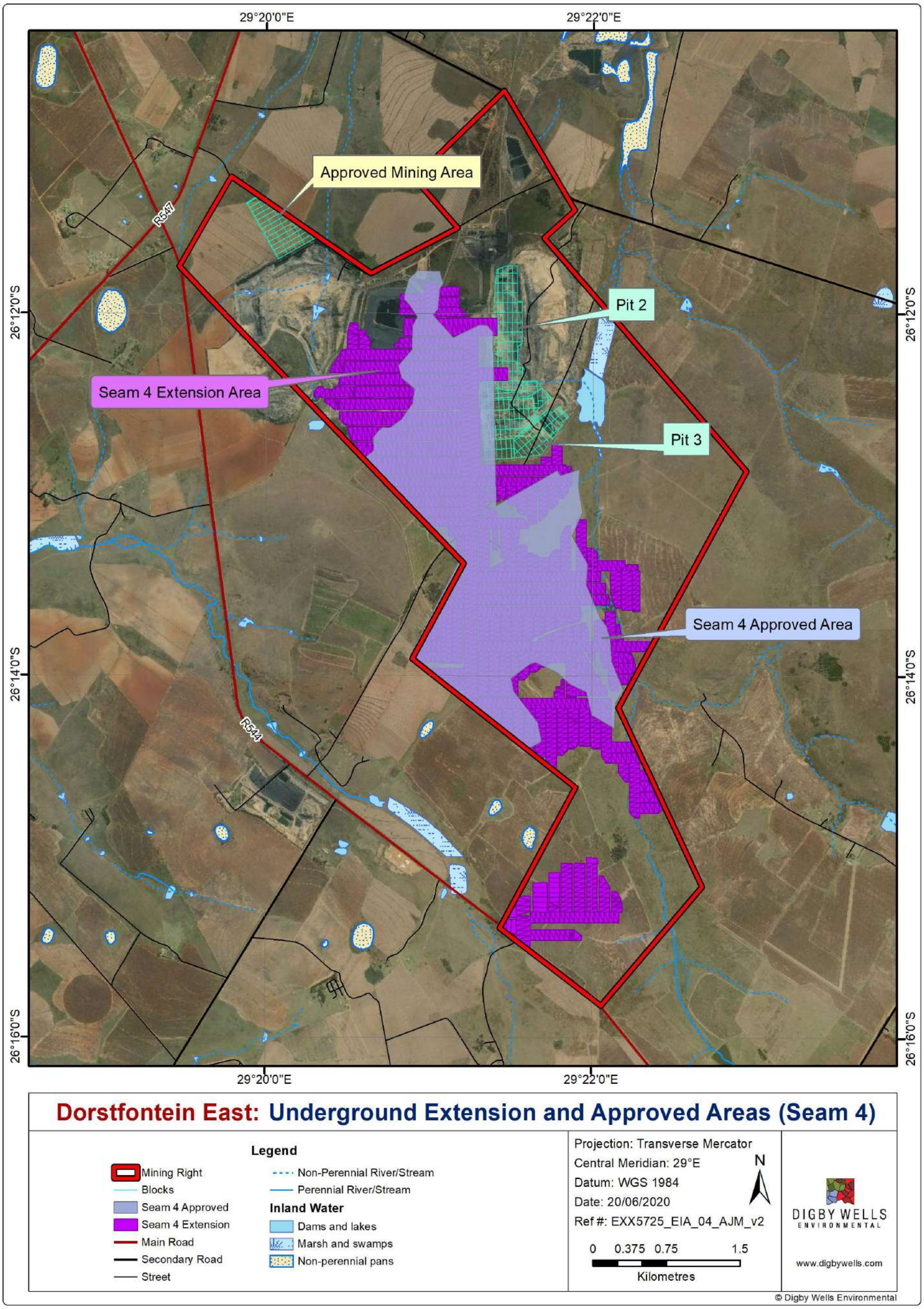


Figure 5-3: Existing Approved and Underground Extension Areas in Seam 4

5.1.1 Additional Surface Infrastructure

For the proposed expansion, DECM will require a new STP and WTP, as well as a water storage tank.

5.1.1.1 *Sewage Treatment Plant*

DECM has an approved STP on site; however, with the extension of underground operations additional sewage capacity is required. The plant will be located in a “dirty water area” in the main workshop and office area and will service up to 220 people per day. The treatment plant will require 45 m^3 of water per day to process 16.2 kg of organic load. The plant is 3 m high, 2.3 m in diameter, with a storage volume of 10m^3. The STP will discharge into the existing PCD.

5.1.1.2 *Water Treatment Plant*

The proposed WTP is located north of the main workshop and office area, also within a previously disturbed area. The plant will treat domestic wastewater only and therefore, no gypsum or brine by-products will result from the treatment process. The effluent emanating from the plant will be collected by the existing PCDs.

5.1.1.3 *Water Storage Tank*

Water from the PCDs will be stored in a raw water tank with a capacity of 300 m^3. This dirty water will be fed into the STP.

5.1.2 Listed and Specified Activities for the Proposed Project

This section details the proposed project activities to be undertaken on site, as well as the Listed Activities in terms of the EIA Regulations, 2014 (as amended). Table 5-1 details the project activities per phase (i.e., Construction, Operational and Closure Phases); and Table 5-2 provides the identified Listed Activities as provided by the EIA Regulations, 2014 (as amended).

Table 5-1: Activities per Project phase

Project Phase	Project Activity
Construction Phase	• In-pit RoM stockpiling.
Operational Phase	• Blasting (only when dykes and other geological features are encountered); • In-pit RoM stockpiling; • Transportation of coal from pit for further processing; • Underground mining machinery maintenance; • Operation of water and sewer reticulation; and • Use of existing haul roads.

Project Phase	**Project Activity**
Closure Phase	• Demolition and removal of infrastructure – once mining activities have been concluded, infrastructure will be demolished in preparation of the final land rehabilitation; • Rehabilitation – rehabilitation mainly consists of spreading of the preserved subsoil and topsoil, profiling of the land and re-vegetation; and • Post-closure monitoring and rehabilitation.

Table 5-2: Listed Activities applicable to the Project

Name of Activity	Areal Extent of the Activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Listing Notice 1				
Construction of access and haulage roads *The development of a road-* *(i) 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* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road-* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.*	2.68 Ha	X-24 *(ii)*	GN R983 under NEMA	-
Operating sewage and water reticulation *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes-* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where-* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	Length (m) Potable Water – 877 m Return Water pipeline – 479 m Sewer Line – 620 m	X-10	GN R983 under NEMA	GN R921 under NEM:WA Category B 4 (10)
Power line construction *The development of facilities or infrastructure for the transmission and distribution of electricity-* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more*	22kV line, 2.3 km long	X- 11	GN R983 under NEMA	-
Listing Notice 2				
Mining of coal by underground mining *Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including-* *(a) associated infrastructure, structures and earthworks directly related to the extraction of a mineral resource; or* *(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing.*	**Seam 2**: 92.1 ha (excluding approved area) **Seam 4**: 185.2 ha (excluding approved area)	X- 17	GN R984 under NEMA	-

Name of Activity	Areal Extent of the Activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Water Use Licence *The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent*	Inclusive of all water and sewage management infrastructure on site.	X- 6	GN R984 under NEMA	GN R921 under NEM:WA Category B 4 (11)

6 Item 3(e): Policy and Legislative Context

This section provides a description of the policy and legislative context within which the Project is proposed.

Table 6-1: Policy and Legislature Applicable to the Project

Applicable legislation and guidelines used to compile the report	Reference where applied
The Constitution of the Republic of South Africa, 1996 Under Section 24 of the Constitution of the Republic of South Africa, 1996 (the Constitution) it is clearly stated that: *Everyone has the right to* *(a) an environment that is not harmful to their health or well-being; and* *(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -* *(i) Prevent pollution and ecological degradation;* *(ii) Promote conservation; and* *(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	Digby Wells is undertaking an EIA process to identify and determine the potential impacts associated with the Project. Mitigation measures recommended will aim to ensure that the potential impacts are managed to acceptable levels to support the rights as stipulated in the Constitution.
National Environmental Management Act, 1998 (Act No 107 of 1998) and EIA Regulations, 2014 (as amended) The NEMA, as amended was set in place in accordance with Section 24 of the Constitution. Certain environmental principles under NEMA must be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The EIA Regulations, 2014 was published under GN R982 on 4 December 2014 and came into operation on 08 December 2014. Together with the EIA Regulations, 2014 (as amended) the Minister also published GN R983 (Listing Notice No. 1), GN R984 (Listing Notice No. 2) and GN R985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended. The EIA Regulations have been made applicable to prospecting and mining activities.	Activities associated with the proposed underground mine are identified as Listed Activities in the Listing Notices (as amended) and therefore require an EA prior to being undertaken. The EA Application was submitted to the DMRE on 13 November 2020. The final SR was submitted on 26 January and was accepted on 28 May 2021. An application for a request for extension to submit the final EIA report was sent to the case officer via email on 10 August 2021. This EIA and EMPr is to be informed by the requirements of the NEMA and Regulations thereunder.
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	The Applicant has applied for a underground mining extension on the farms Dorstfontein 71 IS, Boschkrans 53 IS, Fentonia 54 IS, and Welstand 55 IS. Farm portions have been listed under Section 4. The EIA process is undertaken to meet the requirements of the MPRDA read with the EIA Regulations, 2014 (as amended). Financial Provisioning and Closure Costs are included herein; and the report is appended hereto as Appendix R

<table>
<tr><th>Applicable legislation and guidelines used to compile the report</th><th>Reference where applied</th></tr>
<tr><td><u>National Water Act, 1998 (Act No. 36 of 1998) (NWA)</u>
The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.
GN R704 was published in June 1999 and aims to regulate the use of water for mining and related activities for the protection of water resources and states the following:
• Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100-year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution;
• Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution;
• Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, and
• Regulation 7 details the requirements necessary for the protection of water resources.</td><td>An IWULA and an associated Integrated Water and Waste Management Plan (IWWMP) are required in terms of Section 21 of the NWA for the Project. The IWULA and IWWMP will be compiled and submitted to the Department of Water and Sanitation (DWS) as the decision-making authority.</td></tr>
<tr><td><u>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)</u>
On 29 November 2013, the list of waste management activities published under GN R718 of 3 July 2009 (GN R718) was repealed and replaced with a new list of waste management activities under GN R921 of 29 November 2013. Included in the new list are activities listed under Category A, B and C. These activities include inter alia the following:
• <u>Category A</u> describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA Regulations supporting an application for a Waste Management Licence (WML);
• <u>Category B</u> describes waste management activities requiring an EIA process to be conducted in accordance with the EIA Regulations, 2014 (as amended) supporting a WML application; and
• <u>Category C</u> describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m^3 and storage of hazardous waste in excess of 80 m^3.
The Waste Classification and Management Regulations published under GN R634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification.</td><td>A WML has been applied for due to the nature of mining activities.</td></tr>
</table>

<table>
<tr><th>Applicable legislation and guidelines used to compile the report</th><th>Reference where applied</th></tr>
<tr><td><u>DWS[1] Best Practice Guideline – G1: Storm Water Management Plan (SWMP)</u>
These are guidelines provided by the DWS for the development of a SWMP. The following will be undertaken to develop the conceptual SWMP:
• Delineate the clean and dirty area contributing to runoff (based on the final layout plans) and site-specific hydrological assessments to determine volumes that require to be handled. The SWMP should ensure that temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year, 24-hour event, while permanent drainage installations should be designed for a 50-year, 24-hour recurrence period; and
• Site specific assessments to establish the appropriate mitigation measures and surface water monitoring programme.</td><td>All water management infrastructure will be designed for a 1:100-year, 24-hour rainfall event.</td></tr>
<tr><td><u>DWS Best Practice Guideline – G4: Impact Prediction</u>
The impacts of mine activities on the groundwater environment must be assessed as part of the MR Application, as well as for the IWULA. The baseline conditions must be assessed to define the current aquifer systems, groundwater use and groundwater conditions before mine commencement and to determine the extent of possible future impacts on the groundwater resources.</td><td>An IWULA and an associated IWWMP are required in terms of Section 21 of the NWA.
The IWULA and IWWMP will be compiled and submitted to the DWS as the decision-making authority. The EIA as part of this Project assessed potential impacts on groundwater resources as a result of the Project.</td></tr>
<tr><td><u>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)</u>
The NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and considers the management of alien and invasive species. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance:
• Alien and Invasive Species Lists, 2014 published (GN R599 in GG 37886 of 1 August 2014);
• National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and
• National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R1002, 9 December 2011).</td><td>A Fauna and Flora Impact Assessment has been undertaken and appended hereto as Appendix E.</td></tr>
<tr><td><u>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)</u>
The prevailing legislation in the Republic of South Africa with regards to the Air Quality field is the National Environment Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA). According to the Act, the Department of Forestry, Fisheries and the Environment (DFFE) EA, the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM:AQA.
A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM:AQA is the establishment of National Ambient Air Quality Standards (NAAQS). These standards provide the goals for air quality management plans and provide the benchmark by which the effectiveness of these management plans is measured. The NEM: AQA provides for the identification of priority pollutants and the setting of ambient standards with respect to these pollutants.</td><td>An Air Quality Impact Assessment has been summarised in this EIA/EMPr and is appended hereto as Appendix K.</td></tr>
</table>

[1] Previously the Department of Water Affairs (DWA)

Applicable legislation and guidelines used to compile the report	Reference where applied
National Dust Control Regulations, 2013 The Minister of Water and Environmental Affairs, released on the 01 November 2013 the National Dust Control Regulation, in terms of Section 53, read with Section 32 of NEM:AQA. In the published National Dust Control Regulations, terms like target, action and alert thresholds were omitted. Another notable observation was the reduction of the permissible frequency of exceedance from three to two incidences within a year. The standard adopted a more stringent approach than previously and would require dedicated mitigation plans now that it is in force.	An Air Quality Impact Assessment has been summarised in this EIA and EMPr and is appended hereto as Appendix K.
National Noise Control Regulations, R.154 of 1992 (the Noise Regulations) promulgated in terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) The National Noise-Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCRs) form part of the Environmental Conservation Act and these Regulations apply to external noise. The NCRs differentiates between Disturbing Noise levels (which is objective and scientifically measurable which are generally compared to existing ambient noise level) and Noise Nuisance (which is a subjective measure and is defined as noise that "*disturbs or impairs or may disturb or impair the convenience or peace of any person*"). Local Authorities use Controlled Areas to identify areas with high noise levels. Restrictions have been set out for development that occurs in these Controlled Areas. These regulations make provision for guidelines pertaining to noise control and measurements. The regulations refer to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication. As such, a Noise Impact Assessment in accordance with the NCRs must be undertaken for submission to determine the potential disturbing and nuisance noise levels associated with a development.	A Noise Impact Assessment has been summarised in this EIA and EMPr and the report is appended hereto as Appendix L.
The National Heritage Resources Act, 1999 (Act No. 25 of 1999) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case, the South African Heritage Resources Agency (SAHRA) and Provincial Heritage Resources Authority of Gauteng (PHRA-G), be notified as early as possible of any developments that may exceed certain minimum thresholds. This act is enforced through the National Heritage Regulations GN R548 (2000).	For the Scoping Phase, a Notice of Intent to Develop (NID) was submitted to SAHRA. A Heritage Impact Assessment has been undertaken and included as Appendix M.
Financial Provisioning Regulations, 2015 (GN R 1147 of 2015) The Financial Provisioning Regulations, 2015 prescribe methods for determining the quantum of financial provision for rehabilitation and mechanisms for providing for it. Section 41(1) of the MPRDA has been repealed and Section 24P of the NEMA, as amended, which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds.	The Financial Provisioning Regulations, 2015 are applicable to rehabilitation and closure plans as they prescribe the minimum content of an annual rehabilitation plan and the minimum content of a final rehabilitation, closureand mine closure plan. The Closure and Rehabilitation Report is attached as Appendix R and summarised in this EIA and EMPr.
MPRDA Regulations, 2004 (GN R527 of 2004) The MPRDA Regulations, 2004 specifies that the EMPr must include environmental objectives and specific goals for mine closure. The applicant for a mining right must make prescribed financial provision for the rehabilitation or management of negative environmental impacts, which must be reviewed annually. The Regulations provide specific principles for mine closure including safety and health, residual and latent environmental impacts, etc.	The EMPr is provided in Part B, Sections 5 and 6 of this report..

7 Need and Desirability of the Proposed Activities

The need and desirability of a proposed development forms a key component of an application for environmental authorisation. The Guideline on Need and Desirability (2017) published by the Department of Environmental Affairs sets out a list of questions aimed at interrogating ecological sustainability and justifiable economic and social development in the context of proposed developments.

The DECM is currently operating as an opencast and underground mine. ECC holds an existing MR for coal in the area. ECC is facing challenges regarding the continuation of open cast mining which is projected to produce substantially less RoM coal than what was predicted in ECC's current approved business plan.

The extension of the mining activities underground is proposed to increase the RoM coal and thus lead to greater revenue for the DECM. The Project will be able to contribute to the local economy through job creation and procurement. Increased employment will lead to increased expenditure. The Emalahleni Local Municipality (ELM) in which the Project area lies is characterised by unemployment rates of 26.6% according to the municipality's latest Integrated Development Plan (IDP). The Project could assist in alleviating this unemployment rate.

The SLP ensures that the MR holder contributes to the socioeconomic areas in which they are operating. The SLP further stipulates that ECC commits to providing opportunities and resources for employees to fully develop in the mine's job disciplines. Through external training programmes, learnerships and skills programmes, ECC will develop its employees and the surrounding community.

The mining sector is the strongest contributor to ELM's economy, accounting for almost 55%. The area is rich in coal reserves and supplies the power stations in the area. This contributes to the energy supply of South Africa and employment. By expanding the mining operations at DECM, these benefits can be realised further into the future of the area through the extended LoM.

7.1 Questions to be Engaged with when Considering need and Desirability

The Guideline on the assessment of Need and Desirability (DEA, 2017) includes a number of questions, the answers to which should be considered in the EIA Process. Table 7-1 presents the needs and desirability analysis undertaken for the DECM Project.

Table 7-1: Need and Desirability

Theme	No.	Question	Response
Securing ecological sustainable development and use of natural resources"	1	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?	The proposed Project is within an ecologically sensitive area. During the EIA Phase, the impacts to each environmental aspect were assessed according to the Digby Wells impact assessment methodology. Section 13.1 provides details on the impacts and risks identified for the Project..
	1.1	How were the following ecological integrity considerations taken into account?	
	1.1.1	Threatened Ecosystems	The proposed Project is located in an area dominated by the vegetation type Eastern Highveld Grassland, which according to those authors, is regarded as Endangered. A total of 10 mammals were recorded during the infield assessments. The mammal species were encountered and observed throughout the Project Area within the various habitat units are listed in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. This includes Endangered, Near Threatened, and Vulnerable species. These have been listed in sections 11.4.1 and 11.4.2. A Fauna and Flora Assessment was conducted and is included in Appendix E.
	1.1.2	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.	A Wetland Impact Assessment was conducted and is include as Appendix F. A rapid site survey was undertaken and used to refine the wetland delineation and to determine the Present Ecological State (PES), Ecosystem Services (ES) and the Ecological Importance and Sensitivity (EIS).

Theme	No.	Question	Response
			During the desktop and field assessment, 565.8 ha of wetlands were identified and delineated within the Project Area using the approved methodology by the (Department of Water Affairs and Forestry, 2005). No wetlands will be directly impacted by the surface infrastructure, however, the surface infrastructure falls within the 100 m and 500 m Zone of Regulation of the Pan and Hillslope Seep (fragmented) Hydrogeomorphic (HGM 1 and 7).
	1.1.3	Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)	The project area consists of areas that are classified as Other Natural Areas and is in very close proximity to a CBA.
	1.1.4	Conservation targets	Conservation targets, ecological drivers and an Environmental Management Framework were considered during the EIA Phase and were responded to accordingly (See Section 11, Section 17 and Section B of this report)
	1.1.5	Ecological drivers of the ecosystem	
	1.1.6	Environmental Management Framework	
	1.1.7	Spatial Development Framework (SDF)	The Nkangala District (NDM) IDP, containing the SDF, was referenced for the compilation of this EIA Report.
	1.1.8	Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	A desktop survey of wetlands was carried out for the Scoping Phase which referenced National Freshwater Ecosystem Priority Areas (NFEPA) wetlands. No RAMSAR sites are present in the vicinity of the Project area. An Aquatic Assessment is appended in this EIA Report, see Appendix G. The landscape comprises of channelled valley bottom, depression and bench flat wetlands. No RAMSAR sites are present in the vicinity of the Project area. Coal mining

Theme	No.	Question	Response
			does not align with the Paris Agreement in terms of reducing CO_2 emissions, due to the ultimate emissions the coal-fired plants will produce.
	1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The mineral reserve consists of one economically mineable underground section 4 Seam and 2 Seam. Due to the depth and thickness of the 2 Seam, the DECM resource area shall be mined by underground mining methods. Subsidence may result in water levels rising due to flooding of the underground mine void, potentially contaminating shallower aquifers. In addition, subsidence may also promote surface decant in lower areas through induced fracturing. Also, the Project area will need to be assessed due to potential impacts such as habitat loss, habitat fragmentation, Alien Invasive Plant (AIP) proliferation and loss of faunal and floral species of conservation concern. Digby Wells' impact assessment methodology has been undertaken to identify, determine and assess the potential impacts during the EIA Phase, refer to Section 13.1.
	1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	
	1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	General and hazardous waste will be generated as a result of the Project. The waste will be handled, separated, stored and disposed of accordingly. It is anticipated that all general waste will either be recycled or disposed of at the local municipality landfill site. Hazardous waste will be removed offsite by a hazardous waste contractor.

Theme	No.	Question	Response
			A safe disposal certificate for the removal of hazardous waste will be retained as proof of safe disposal.
	1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	All heritage resources identified within the Project area are of negligible cultural significance. The Cultural Heritage sites in the Project area were investigated during this EIA Phase and are presented in Appendix M. A Heritage Impact Assessment was undertaken during the EIA Phase to identify and assess any potential impacts on existing cultural heritage and graves within the Project area. Heritage resources identified on site include the following: **BGG-001**- Burial ground of approximately 19 graves. These are marked through various dressings, including: cement fittings, brick fittings, possible laterite and stone and soil heaps, with or without headstones. Headstones consist of cement or a single upright stone or brick. Two headstones have legible inscriptions although only one has a legible date (1985). The burial ground had a fence at some time, but this is now in a state of disrepair. **HST-001**- Remains of what appears to be a one-roomed structure built on a small platform / raised foundation. The structure has one door and no windows were present. The structure was made of stone and plaster. The structure is surrounded by four small rectangles made of brick – it would appear these are gardens. The Heritage baseline is further discussed in Section 11.12.

Theme	No.	Question	Response
	1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Coal extraction for use in electricity generation is a non-renewable energy resource, however, South Africa is dependent on coal and until the energy supply and demand can feasibly be replaced with renewable energy, non-renewable energy sources will be required. Mitigation measures aimed at avoiding, reducing and / or managing the negative impacts are found in this report. The extent of positive impacts associated with this Project are conveyed in Section 13.1 and associated specialist studies which have been appended.
	1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	The EIA Phase has confirmed that no wetlands will be directly impacted by the surface infrastructure, however, the surface infrastructure falls within the 100 m and 500 m Zone of Regulation of the Pan and Hillslope Seep (fragmented) (HGM 1 and 7). The extent of potential impacts and potential mitigation is outlined in Section 13.1.
	1.7.1	Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of	Historically, Eskom has struggled to secure coal from South African mining operations due to international prices of coal yielding more profit for mines. South Africa will be a coal-dependent country for the foreseeable future.

Theme	No.	Question	Response
		waste they generate, without compromising their quest to improve their quality of life)	While the mining and use of coal has its disadvantages for the environment, it is an important part of South Africa's development. The socio-economic impacts of coal mining include employment and increasing the country's economic value through the support of various industries.
	1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)	
	1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	A sensitivity map was generated in the pre-application phase which identified all the natural sensitivities identified. The Project increases dependency on resources (i.e. non-renewable resources).
	1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?	Risk management procedures implemented include the identified avifauna species. Also, mitigation measures contained in this report reduce environmental risks. However, it should be noted that mining has irreversible environmental impacts that cannot be avoided. Environmental legislation and frameworks were applied while compiling reports for the EIA Phase. These were important as they helped consider the limits of the ecosystems and contained current knowledge about the consequences of decisions and actions.
	1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Part A, Section 20 outlines the gaps, uncertainties and assumptions which were presented in each of the special studies undertaken.
	1.8.2	What is the level of risk associated with the limits of current knowledge?	

Theme	No.	Question	Response
	1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
	1.9	How will the ecological impacts, resulting from this development impact on people's environmental right in terms following:	The key positive impacts associated to the proposed Project include but are not limited to: • Social development as part of the SLP; • Multiplier effects on the local and regional economy; • Skills training; and • Social investment in local communities. As with all coal mining, there will be a general deterioration of the environment. Specifications on the negative impacts and their mitigation measures are found in the Section 15 below. For the detailed methodology used to determine the significance of the identified impacts, refer to Part A, Section 13.2.
	1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	
	1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
	1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	
	1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	
	1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the	Alternatives in terms of infrastructure placement were investigated in the pre-application phase, through the

Theme	No.	Question	Response
		different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	identification of sensitive areas on site. Sensitive areas on site were avoided as far as possible.
	1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Cumulative impacts were investigated and presented under Section 13.2.
Promoting justifiable economic and social development"	2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
	2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	The socio-economic baseline took the NDM and Gert Sibande District Municipality (GSDM) IDPs for the period 2019-2020 into consideration. The IDPs present issues and requests raised by residents in each local municipal district of the Municipalities.
	2.1.2	Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	The spatial and economic development projects will be implemented through the Municipal IDP. The proposed Project will promote and support the sustainability of existing business, as well as assist in increasing local beneficiation and shared economic growth for the confirmed 14 years LoM.
	2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	
	2.1.4	Municipal Economic Development Strategy ("LED Strategy").	
	2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	The proposed Project will result in limited job opportunities. The positive impact from the Project will be recognised through implementing the Community Development Projects.

Theme	No.	Question	Response
	2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	The Applicant is committed towards contributing to the socio-economic activities of the immediate community and the region. ECC commits to the requirements of the Skills Development Act. In addition, the company will ensure that the contractors have fully developed skills plans and all colliery employees receive training and development in accordance with these plans.
	2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	The Company will implement the SLP Community Development projects and initiatives which are based on the requirements identified by surrounding communities through the SLP consultation process.
	2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	ECC will offer portable skills to employees throughout the LoM, to ensure that they have skills other than those required by the mine, to lessen the negative impact and foster continued livelihood.
	2.5	In terms of location, describe how the placement of the proposed development will	
	2.5.1	result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	Apart from a continuation of employment opportunities created, the mine is also legally obligated to commit towards training of its labour force as per skills development legislation for the industry. The mine makes provision for a skills development plan of its local workforce through the programmes required by legislation that regulates SLPs of mines. Required training includes functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and

Theme	No.	Question	Response
			management positions, bursary and internships and portable skills training.
	2.5.2	reduce the need for transport of people and goods	The product will be transported to the plant feed stockpile area by means of truck haul and from there, fed into the plant through a conveyor.
	2.5.3	result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	
	2.5.4	compliment other uses in the area,	A Traffic Impact Assessment was undertaken to establish potential congestion on surrounding roads and provide mitigation measures to manage the impact. A ‘Full’ access from the D1947, approximately 3.5km south-east of the intersection of the R544 and D1947, with several entrance lanes (light vehicles and trucks separate) and one exit lane, all measuring a combined 40m in width at the gate. The gate is about 150 m away from the road edge of the D1947, with a hard park area to account for queueing of haulage trucks.
	2.5.5	be in line with the planning for the area,	The current proposed LoM is 14 years and the Closure and Rehabilitation Report will consider end-land use in line with the LED Strategy.
	2.5.6	for urban related development, make use of underutilised land available with the urban edge,	Not applicable. The proposed DECM Project area is outside an urban area.
	2.5.7	optimise the use of existing resources and infrastructure,	The existing infrastructure at Dorstfontein East Mine will be utilised as far as possible.
	2.5.8	opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for	No bulk infrastructure will form part of this development.

Theme	No.	Question	Response
		the settlement that reflects the spatial reconstruction priorities of the settlement),	
	2.5.9	discourage "urban sprawl" and contribute to compaction/densification,	The project area and surrounds are agricultural and rural areas, and cannot therefore influence urban sprawl.
	2.5.10	contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	The employment will prioritise Historically Disadvantaged South Africans as beneficiaries. Existing infrastructure at the DECM will be utilised as far as possible for the transportation, stockpiling and processing of coal. No municipal infrastructure will be used.
	2.5.11	encourage environmentally sustainable land development practices and processes,	Mining is inherently unsustainable and a destructive activity involving the taking of a non-renewable resource. The successful rehabilitation of the area will contribute to mitigating the impacts caused by mining.
	2.5.12	take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	The location of the proposed Project is dependent on the location of the identified mineral resource (coal reserve).
	2.5.13	the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	The proposed project will allow the mine to continue contributing to the local, regional and national Gross Domestic Product (GDPs), and also to the local communities through potential employment of workers and local contractors, as well as other influences and community upliftment programmes that are undertaken by the mine through their SLP.

Theme	No.	Question	Response
	2.5.14	impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Burial ground of approximately 19 graves. These are marked through various dressings, including: cement fittings, brick fittings, possible laterite and stone and soil heaps, with or without headstones. Headstones consist of cement or a single upright stone or brick. Two headstones have legible inscriptions although only one has a legible date (1985). Remains of what appears to be a one-roomed structure built on a small platform / raised foundation. The structure has one door and no windows were present. The structure was made of stone and plaster. The structure is surrounded by four small rectangles made of brick – it would appear these are gardens., the report is also included as Appendix M.
	2.5.15	in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	The proposed project will ensure employment, as well as programmes implemented from the mine's SLP.
	2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	Socio-economic impacts undertaken during the EIA Phase and included in Appendix P.
	2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Gaps in knowledge, uncertainties and assumptions have been determined during the EIA Phase and presented in the EIA Report, see Section 20.
	2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	

Theme	No.	Question	Response
	2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
	2.7	How will the socio-economic impacts, resulting from this development impact on people's environmental right in terms following:	
	2.7.1	Negative impacts: e.g. health (e.g. HIV- Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	The aim of the SLP is to initiate projects which develop the surrounding communities which may be impacted by a proposed mining project. The mine itself will have a LoM of 14 years and therefore will present long-term sustainable employment. The Community Development Projects associated with the SLP will prioritise Historically Disadvantaged South Africans as beneficiaries.
	2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	
	2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
	2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	
	2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?Considering the need for social equity and justice, do the alternatives identified, allow the "best	

Theme	No.	Question	Response
		practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
	2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
	2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	
	2.13	What measures were taken to:	
	2.13.1	ensure the participation of all interested and affected parties,	During the pre-application and Scoping Phase, an Interested and Affected Parties (I&AP) database was developed to identify and verify the directly and indirectly affected landowners or land occupiers as well as the potentially affected surrounding communities. This was updated and used throughout the EIA process as well.
	2.13.2	provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Digby Wells will maintain and update the I&AP database to ensure communication with all registered I&APs. Site notices have been erected in various locations around the site and in the nearest communities to announce the Project, SMS notifications will be utilised to provide progress reports to I&APs as well as Digby Wells contact information for further consultation. Due to COVID-19 Regulations, Focus Group meetings will be held (virtually and in person) in the EIA Phase

Theme	No.	Question	Response
			to engage with any I&AP who wishes to attend, and the Project will be presented at these meetings as well as the findings of the impact assessments. COVID-19 measures and protocols during face-to-face meetings will be taken into consideration.
	2.13.3	ensure participation by vulnerable and disadvantaged persons,	Section10 of this Report, describes the PPP and activities that were undertaken during the Scoping Phase and EIA Phase for the proposed Project. Focus Group meetings (virtual and in person) are planned to be held in the EIA phases of the Project. Efforts will be made at the meetings to be held to ensure that all participants can participate in a language they are able to understand.
	2.13.4	promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	The consultation process seeks to inform affected communities of the positive and negative impacts associated with the proposed Project and provide opportunity for any stakeholder to raise concerns which will be responded to both on record in the reports and through direct written response (where possible). Furthermore, the Applicant will create community forums with guidance form the Municipality.
	2.13.5	ensure openness and transparency, and access to information in terms of the process,	Digby Wells is bound by legislation and regulations to share information pertaining to the Project, to be transparent and impartial.

Theme	No.	Question	Response
	2.13.6	ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and	All stakeholder needs will be accommodated as far as is reasonable.
	2.13.7	ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was be promoted?	The EAP cannot force participation from specific demographics. Cultural norms will be respected and adhered to; however, no demographic can be excluded from public consultation and therefore all registered stakeholders and meeting attendees will be considered intrinsic to the public consultation process and outcomes. COVID-19 measures during face-to-face meetings will be taken into consideration.
	2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	
	2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected	The Applicant must produce a Health and Safety policy and best practice on site, compliant with the Mine Health and Safety Act, 1996 (Act No. 29 of 1996).
	2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	
	2.16.1	the number of temporary versus permanent jobs that will be created,	Most of the staffing will be employed by the mining and engineering contractors and will be primarily from the Local Municipality with some from other parts of South Africa and/or neighbouring countries.

Theme	No.	Question	Response
	2.16.2	whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	The planned workforce will consist of permanent employees and contractor employees primarily from the Local Municipality with some from other parts of South Africa and/or neighbouring countries.
	2.16.3	the distance from where labourers will have to travel,	The planned workforce will consist of permanent employees and contractor employees primarily from the Local Municipality with some from other parts of South Africa and/or neighbouring countries.
	2.16.4	the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	
	2.16.5	the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	The main land uses of the farmland include cultivation, cattle grazing, infrastructure.
	2.17	What measures were taken to ensure:	
	2.17.1	that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and	The Scoping and EIA process requires governmental departments to communicate regarding any application. In addition, all relevant Departments and key stakeholders have been notified about the project by the EAP and registered as Interested and Affected Parties who will continue to be notified and engaged with regarding the project throughout the EIA process.
	2.17.2	that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	Not Applicable.
	2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	The Financial Liability for the Applicant has been calculated to determine the cost of closure and rehabilitating the mine site to a post-closure end land use which is sustainable and in the

Theme	No.	Question	Response
	2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	best interest of both the surrounding communities and the environment.
	2.20	What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	
	2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	The layout of the proposed mining infrastructure was informed by sensitivity mapping of the farms directly impacted by the mining activities.
	2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Cumulative impacts were investigated and presented under Section 13.2. .

8 Motivation for the Overall Preferred Site, activities and Technology Alternative

The location of the Project has been decided by the location of the identified coal resource. DECM operates under an approved MR (Ref. No. **MP 30/5/1/2/2/51 MR**) for opencast and underground mining. The current activities include opencast operation, Pit 1 and Pit 2, however the deeper lying coal will be accessed through the proposed underground mining operations. DECM therefore intends to further extend the LoM through the exploitation of these identified additional coal reserves between 2021 until 2034 (14 years). Underground mining of 2 Seam and 4 Seam has already commenced under **MP 30/5/1/2/2/51 MR**, this EA application includes the extension of the 2 Seam and 4 Seam mining activities.

9 Full description of the Process Followed to Reach the Proposed Preferred Alternatives Within the Site

This section describes the alternatives investigated during the preliminary phase of the Project.

9.1 Details of Alternatives Considered

The areas of mining which have been proposed are within the existing MR and disturbed areas. The alternatives considered in this report and during the pre-feasibility studies undertaken include the mining method, resource access, mining equipment requirements, production and scheduling, employment and the "No-Go" alternative (the option of not proceeding with the Project).

9.2 Mining Method

ECC considered opencast mining the extension areas versus underground mining. Digby Wells and ECC consulted with the DWS and the DMRE at the pre-application phase of the project. These consultations allowed ECC to present the different mining options as well as the potential environmental impacts thereof. Due to the sensitivity of the wetlands on the surface, ECC has opted to rather pursue underground mining. The impact to watercourse features as a result of underground mining have been investigated during the EIA Phase, however, it is recommended that all mitigation and management measures are adhered to.

9.3 No-Go Alternative

Should the proposed Project not proceed ("no-go"), the *status quo* shall remain. Current surface mining operations are limited in their LoM and thus the financial implications of not extending this LoM shall be negative. Opportunities for further employment and skills development in the area will also not be realised.

The no-go alternative also means that all potential negative impacts associated with the proposed mine and its associated infrastructure would not occur. Hence, the EIA process will determine if the project would result in any environmental or social fatal flaws that may result in the project the no-go alternative being the preferred alternative.

10 Details of the Public Participation Process followed

The PPP was developed to ensure compliance with environmental regulatory requirements and to provide I&APs with an opportunity to evaluate the proposed Project. During this process stakeholders are able to provide inputs and to receive feedback from the environmental specialists and/or proponent.

During the Scoping Phase, the following core stakeholder engagement activities were undertaken:

- Stakeholders (including Government Departments, landowners, land occupiers, communities, Non-Governmental Organisations (NGOs) , agricultural organisations, Parastatals and businesses) have and will continue to be identified and captured in a stakeholder database;
- A Background Information Document (BID) and letter was distributed to the identified I&APs together with the placement of adverts and site notices around the Project area;
- The environmental SR and associated documentation was made available for public comment for a period of 30 days, from 13 November 2021 to 14 December 2021;
- Due to the COVID-19 national lock down, the Draft SR was released electronically and could be accessed on the Digby Wells website and via our data-free service portal;
- A stakeholder database which represents government authorities, directly affected and adjacent landowners, as well as communities in and around the proposed Project area compiled during the Scoping phase will continuously be updated until the final EIA Report to DMRE:
  - **To Note:** The Protection of Personal Information Act, 2013 (Act No. 4 of 2013) (POPI Act), took effect on **01 July 2021**. The POPI Act regulates how personal information of individuals in South Africa is collected, stored, processed, and shared; and
  - Digby Wells is required to comply with the POPI Act and hereby request all I&APs who were previously registered for this Proposed Project to provide consent to be included for the EIA phase. Please see Appendix C for the consent form. In addition, a stakeholder database will not be shared with the public.
- Suggestions and concerns received during the public comment period have been recorded and responded to in Table 10-3 below, and included in the Public Participation Report attached in Appendix C.

10.1 Consultation with Stakeholders during Scoping Phase

A notification letter and Short Message Service (SMS) were utilised to distribute invitations to the I&APs. Telephonic discussions were also undertaken throughout the Scoping Phase to inform I&APs about upcoming Focus Group Meetings (FGMs),, as well as to obtain comments. These three methods were employed to ensure that the stakeholders were well informed and given the opportunity to attend the meetings, affording them an opportunity to raise comments related to the Project.

10.1.1 Public Participation Activities

Table 10-1 provides a summary of the public participation activities undertaken during the Scoping Phase together with the relevant reference proof.

Table 10-1: Public Participation Scoping Phase Activities

Activity	Details
Compilation of Stakeholder Database	A stakeholder database for the proposed Project was developed. The database included stakeholders who represent various sectors of society, including directly affected and adjacent landowners, in and around the proposed Project area. A Land Tenure Map was developed and presented to the public, showing directly and indirectly affected farms.
Distribution of BID and Registration and Comment Forms (RCF)	A BID which included a project description, information about the relevant legislation, the competent authorities, and details of the appointed EAP was prepared and distributed via email on **13 November 2020.** Registration and Comment Form was distributed simultaneously with the BID via email for stakeholders to use for formal registration as I&APs or to submit initial comments on the Proposed Project on **13 November 2020.**
Distribution of an announcement letter	An Announcement letter was distributed to notify registered I&APs of the availability of the Draft SR for public commenting via email **13 November 2020.**
Placing of newspaper advertisement	An English Newspaper advertisement was published on **13 November 2020** in the Witbank News, which is a local newspaper that distributes to the surrounding areas. This was public during the Scoping Phase to notify I&APs of the availability of the Draft SR for public review and commenting. In addition, the public was encouraged to register as I&APs for the project.
Displaying site notices	English Site notices were put up at various places around the project area. The site notices contained information relating to the proposed project, the EAP and registration process for I&APs for the public comment on **13 November 2020**.

Activity	Details
Stakeholder meetings	Two Focus Group Meetings were held on **9 December 2020** at Dorstfontein West Mine Regional Boardroom. Details of these meetings are as follows: - The first meeting was held with the GMLM Ward 15 committee at 09:00 to 10:00: and - The second meeting was held with the directly and affected landowner at 10:00 to 11:00. Furthermore, a Focus group meeting with Emalahleni Local Municipality Ward 25 councillor and representatives was held via Teams on **11 December 2020** at 09:30**.** The purpose of the FGM was to discuss the proposed project and capture all stakeholders' inputs.
Public review of the Draft SR	Announcement of the availability of the Draft SR was emailed and SMSs were sent to stakeholders on Friday **13 November 2020.** The DSR was made available on http://view.datafree.co/PublicDocuments/ (under Public Documents), at the Dorstfontein East and West Mines as well as at the Kriel Library. *(The 30-day legislated comment period for the Draft SR was from 13 November 2020 to 14 December 2020.)*
Announcement of the Final SR	Final SR will be submitted to the DMRE on 25 January 2021. A notification letter for availability of the Final SR will be emailed to all stakeholders on the database. The Final SR will also be made available on http://view.datafree.co/PublicDocuments/ under Public Documents.
Obtained comments	Comments, issues of concern and suggestions received from I&APs were captured and responded to in the CRR.

10.1.2 Consultation with Stakeholders during the EIA Phase

During the EIA Phase, the following main public participation activities will be undertaken:

- Provided feedback on the findings of the specialist studies conducted and mitigation measures proposed by means of consultation with I&APs;
- Releasing the Draft EIA Report and associated specialist studies to the public for comment;
- Consultation with I&APs through Focus Group Meetings;
- Consultation with various Organs of State during the public review period; and
- All comments raided during this period will be included in the CRR, which will be included in the Final EIA Report for submission to the DMRE.

Table 10-2 provides more detail regarding the Stakeholder Engagement activities undertaken thus far, together with referencing materials.

Table 10-2: EIA Phase Consultations

Activity	Details
Announcement of Draft EIA Report	Notification on the availability of the Draft EIA Report were emailed and SMSs were sent to stakeholders together with the formal Project EIA Phase notification letter and Registration and Comment Form (RCF) on 30 September 2021. The Draft EIA Report will be made available on Digby Wells' website via a data free link on http://view.datafree.co/PublicDocuments/ (Under Public Documents). *(A 30-day legislated public review and commenting period for the draft EIA report will commence on 01 October 2021- 30 October 2021)*
Focus Group Meeting	The objective of the FGMs is to discuss the Proposed Project, obtain comments on the Draft EIA Report and capture all stakeholders' inputs. FGMs will be held between 1 October 2021 and 30 October 2021. Please note that invitations will be made telephonically, via emails and SMSs. I&APs will be notified two weeks prior to the actual meetings. A presentation will be prepared and discussed during these meetings.
Obtaining comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders will be captured in the CRR.
Announcement of the Final EIA Report	The Final EIA Report will be submitted to DMRE on 05 November 2021. A notification letter on the submission of the Final EIA Report will be emailed to all stakeholders on the database. The Final EIA Report will also be made available on Digby Wells' website via a data free link on http://view.datafree.co/PublicDocuments/ under Public Documents.

10.2 Summary of Issues Raised by I&APs

The CRR was compiled capturing all stakeholder comments during the Scoping Phase public comment period. The CRR is contained in Table 10-3 overleaf.

Table 10-3: Comments Received During the Draft Scoping Phase

Project Phase	Date of Receipt	Format	Contributor	Organization/ Community	Main Issue Category	Issue Description	Response
Scoping Phase	09-Dec-20	Face to Face	Edmund Muller	Land Owner	Impact of mining activities	How will the fountains in the area be affected by the mining activities?	From the Dorstfontein East Hydrogeological Investigation Report compiled by GCS in 2019, it should be noted that two springs were identified on Mr Muller's farm on Farm Fentonia 54 IS and another spring located on Farm Rietkuil 57 IS. These features have been taken into consideration. The impacts to the surface and groundwater features have been assessed in the EIA Phase.
						Mining activities will lead to an influx of people which will result in stock theft and veld fires	The extension of the mine will not result in any additional recruitment of new workforce. ECC intends to secure employment for the current employee workforce. The mine will ensure that veld fires are contained and that they do not result in any damage or losses. In addition, the mine inspects the fire breaks every month and removes grass within the firebreak zone.
Scoping Phase	09-Dec-20	Face to Face	Joseph Mtshweni	Ward Councillor (Ward 15)	Access to Information	Requested Background Information Documentation (BID). Indicated that comments will be made and submitted in due time.	Documents handed over to the Councillor.
					Communication	The mine needs to communicate with the community with regards to mining activities in our community and avoid rushing to court to have issues resolved.	The mine will communicate effectively with the affected community to avoid or limit conflicts with the affected community.
					Employment and Business Opportunities	The biggest challenge is the existing community Forums as they will want employment opportunities and will also want to do business with the mine.	DECM will have opportunities during the Construction Phase for infrastructure development projects. However, the proposed mine expansion will only create longer term employment for the mine's current workforce.
					Heritage resources	Respect the graves.	Mitigation measures will be put in place to limit impacts on graves. Access will be granted for families who wish to visit the graves. The specialist studies to be undertaken as part of the EIA process will provide further mitigation and management measures. Thus, a conclusive response will be provided once the studies have been concluded.
					Socio-economic	The biggest issue is the extent of the mine that might affect the community.	*A plan was shown in the presentation of the directly and indirectly affected farm portions.* All mining which forms part of this application will be underground mining. The impacts associated with mining the underground area have bene assessed by the team of specialists during the EIA Phase and are presented in this report.
					Groundwater	Protect the boreholes.	A network of monitoring boreholes will be provided by Digby Wells' Hydrogeology team and these boreholes will form part of ECC's monitoring programme. ECC must monitor these boreholes to see whether the water level is dropping or if the water is being

Project Phase	Date of Receipt	Format	Contributor	Organization/ Community	Main Issue Category	Issue Description	Response
							contaminated. If any impact occurs and is caused by mining, ECC will be liable to either rectify the issue (in the case of water quality impacts) or compensate the borehole user in instances where water loss is experienced.
Scoping Phase	11-Dec-20	Teams Meeting	Maggy Magagula	Ward Councillor (Ward 25)	Access to Information	The community is not using the library, so where will the scoping report be placed? Is it possible that a different location can be used for the document? The Community Forum comes to the office requesting information which I am not in possession of and I do not want to be part of the Forums.	Thank you for noting this. In future, copies of the public comment documents will be placed at the Councillor's offices. Communication between ECC and the community is through the Forum. ECC communicates with them since the Council does not attend Forum meetings, of which information ends only with the Forum. It is suggested that the Council establishes communication with the ward constituents so that information can be shared easily.
					Business Opportunities Skills Development and Training	Are there any business opportunities that will be offered to the community? The people that you are training are you going to hire them?	The current application will allow limited opportunities for employment during the construction phase. However, ECC does already offer training programmes as part of the approved SLP.
					Location of Project	The project is in the area of Dorstfontein. How many hectares will be utilised, and is it private land?	The application area is 3 288.53 ha (surface area). ECC owns most of the farms however Farm Fentonia 54 IS Portions 1,2 and 3 are privately owned.
					Impact of mining activities	Are you going to blast?	Yes, but all activities will be underground. The severity of blasting underground is less than blasting for open cast mining.
					Applications	On the presentation, you mention that you applied for a water license. Is it approved?	Yes. ECC will apply for a Water Use Licence through Digby Wells Environmental. Currently, the process is in the Scoping Phase. The Water Use Licence process will align with the EIA Phase. These processes rely on the Specialist Reports being completed to inform the EIA Report and the IWWMP Report. Digby Wells intends to release these reports out to the public simultaneously for review. Also note that the Scoping Report must be approved by the DMRE before the process can proceed to the EIA Phase.
				Department of Agriculture	Land and Soil Management	The Department of Agriculture, Land Reform and Rural Development has no comments at this stage. Comments will be provided upon receiving the EIA Report.	Noted.

11 The Environmental Attributes Associated with the Alternatives

Various specialist studies have been undertaken at different stages of the DECM proposed expansion project, these phases include the pre-feasibility study, the environmental scoping phase and the EIA phase.

Baseline information that was obtained from the previous EMPr are attached to this report as Appendix S and Appendix T and are referenced accordingly. A brief overview of previously collected baseline information is provided in Table 11-1 and Table 11-2 below.

Table 11-1: Baseline Information extracted from the EMP - Dorstfontein Expansion Project Report (Ref. No. MP 30/5/1/2/2/51MR)

Specialist Study	Baseline Information
Geology	The coal-measures on DECM are hosted within a roughly 100 m thick horizon consisting of sandstone and siltstone, subordinate mudstone, shale and conglomerate within the Vryheid Formation of the Ecca Group of the Karoo Supergroup. The coal-measures host five coal seam groups as discussed Appendix S. The DECM property is located on the boundary between the Witbank and the Highveld Coalfield. This natural boundary is formed by a basement ridge called the Smithfield Ridge. During the deposition of the Karoo this ridge formed high ground on the depositional surface. Generally the proximity of ground to this ridge is associated with a lower perspectivity for coal.
Topography and Geomorphology	In the East Mine, there is a stream flowing in a northerly direction towards the Olifants River. This stream has two tributaries that flow in an easterly direction across the mineral reserve. Surface elevation in the East Mine varies between 1 540 mamsl in the north and 1 640 mamsl where the slope rises up to the Klein Vaalkop Hill on the western boundary. The Olifants River flows in a north, north-easterly direction (bordering the DECM on its eastern side). North of the DECM the Olifants River turns in a north-north-westerly direction. Just south of the Richards Bay Coal Terminal (RBCT) railway line the Olifants River turns in a westerly direction.
Climate	The DECM is located in the "Highveld" climatic region of South Africa, which has a warm, mild, summer rainfall climate. There are four distinct seasons. A well-formed overland anticyclonic high-pressure system in winter maintains dry air over the region and sharp frosts occur. It is generally warm during the day in all seasons, but it can get cold at night in winter. Spring is heralded by an increase in wind and rising of daily temperature highs. Summer is the rainy season, while in autumn a fairly rapid drop in daily minimum temperatures is experienced.
Precipitation	The DECM is situated in South Africa's summer rainfall region with an annual average rainfall of 711 mm per year. Rain peaks early in the season, in November and then again in January while the winter months are characterised by a long and very dry period.
Temperature and Humidity	The warmest period is December/January, when maximum temperatures average above 25°C, while June is the coldest with daytime temperatures averaging 16.5°C and overnight temperatures frequently dropping below freezing. The winter period is also very dry with little or no rainfall and relative humidity dropping below the 40% mark.

Specialist Study	Baseline Information
Wind	Winds are generally north-westerly in the winter and north-easterly or north-westerly in the summer, with the strongest wind speeds recorded in late winter, during the period July/August. More than half the data shows period of calm wind (<0.5m.s^{-1}).
Public Participation Process	**Authority Liaison** The EAP at the time, GCS, continuously liaised with the DMRE, keeping all relevant personnel updated on progress and following their feedback. The project has been outlined to the DME during an introductory meeting at DECM on 3rd of October 2007 and subsequent Scoping Meetings on the 1st of November 2007. On 6 December 2007, an authorities meeting was held with Mpumalanga Department of Agriculture and Land Administration (MDALA), at DECM. All authorities were also invited to attend the open day on 18 April 2008 at the Kriel Golf Club. **Notification** Site notices were placed at public places including, the entrance to the DECM, TNC Village, Tubelihle Village, Ga-Nala Municipal Offices, and Clinic in Ga-Nala. Advertisements were also places in the Citizen, The Ridge Times and Witbank News on four separate occasions (October 2007, January 2008, February 2008 and April 2008). Public and focus group meetings were conducted at Hoërskool Kriel and Kriel Collieries Golf Club during both phases, Scoping and EIA Phase .
Soils Land Use and Land Capability	**Soils** The major soil types encountered include those of the orthic phase Hutton, Clovelly Griffin and Glencoe along with the hydromorphic forms, including the Pinedene, Avalon, Westleigh, Kroonstad and Katspruit. **Land Capability** The land capability of the study area was classified into four classes (wetland, arable land, grazing land and wilderness) according to the Chamber of Mines Guidelines (1991). The criteria for this classification are set below. **Arable Land** The land capable for sustaining arable crop production will require the utilization of the deep well drained, yellow-brown (Clovelly) soils that occur on the mid-slope and upper mid-slope positions. In addition, there are some of the deeper hydromorphic soil forms that are

Specialist Study	Baseline Information
	capable of sustaining agricultural crop production, if good management practices are employed. The more structured and shallow hydromorphic soils are not considered to be arable soils under the classification. **Grazing** The areas that classify as grazing land are generally confined to the shallower and transitional zone, hydromorphic soil Forms that are moderately well drained. These soils are generally darker in colour, and are not always free draining to a depth of 750 mm, but are capable of sustaining palatable plant species on a sustainable basis, especially since only the subsoils (at a depth of 500 mm) are periodically saturated. **Conservation/Wilderness** The areas that classify as either conservation or wilderness land are found associated with the shallower and rockier soils. **Wetlands** The wetland areas are defined in terms of the wetland delineation guidelines, which use both soil topography as well as botanic criteria to define the limits to this domain. In general, this zone is dominated by hydromorphic soils, and plant life that is associated with aquatic processes. The soils are generally dark grey to black in the topsoil horizons, and high in transported clays, and show pronounced mottling on gleyed backgrounds in the subsoils. These soils occur within the zone of groundwater influence. The combination of soil types and hydromorphic vegetation was used to delineate the wetland soils. The pre-mining land capability of the site is defined by a combination of the topography, geology and the soils mapped in the area.

Flora	The flora baseline environment is contained in this report as Appendix S. The Project area falls within the Grassland Biome of South Africa (Low, A & A G Rebelo, 1998), and is regarded to be Moist Sandy Highveld (38) (North-eastern Sandy Highveld-A57 or Eastern Bankenveld –A61C). The area is characterized with high rainfall on cold, frosty, eastern Mpumalanga Highveld, together with sandy soils. The property has largely been ploughed, which has restricted naturally vegetation to patchy remnants, which are often overgrazed.
	• Dominant Species present on site comprises the following:
	    • Reeds (*Typha capensis);*
	    • Sedges (*Cyperus dives, Cyperus rupestris, Cyperus spaerocephalus, and Mariscus congestus);*

Specialist Study	Baseline Information
	• Grasses (*Cymopogon excavates, Digitaria eriantha, Hyparrhenia hirta, Imperata cylindrica, Cynodon dactylon, Eragrostis plana, etc).* **Alien Weeds and Invasive Plants** The grassland is generally disturbed through the cultivation of land and many exotic and indigenous weedy plant species have established in this area. The grassland is generally disturbed through the cultivation of land and many exotic and indigenous weedy plant species have established in this area. **Endangered and Rare Species** Due to the general disturbance of the grassland through the cultivation of the land, no threatened or protected plant species had been observed during past or present investigations.
Fauna	During the site visit in October 2003 for the exciting approved EMPr, no mammals or signs of mammals were observed. The only mammal observed during the site visit in January 2008 was the suricate (*Suricata suricatta).* **Endangered or Rare Species** Only one Red Data butterfly species have been recorded (*Poecilmites aureus*) in the ½ grid square 2629A (Henning & Henning, 1989), but it appears unlikely that the species would occur on site due to the habitat requirements. Due to the general disturbance of the grassland through the cultivation of the land, no threatened or protected animal species had been observed during past or present investigations. **Avifauna** An analysis based on bird data generated from 16 wetland features showed that the Red-knobbed Coot (*Fulica cristata*) was the most dominant species from the area, which was followed by the Yellow-billed Duck (*Anas undulata*), Little Grebe (*Tachybaptus ruficollis*), Reed Cormorant (*Phalacrocorax africanus*) and Blacksmith Lapwing (*Vanellus armatus*). These species are widespread and abundant across the mesic eastern regions of southern Africa and not entirely restricted to a particular wetland habitat type. They are therefore often considered to be generalist waterbird taxa with opportunistic life histories.
Surface water	**Surface water catchment**

Specialist Study	Baseline Information
	The mining area falls within the greater Upper Olifants River catchment. The project area with the exclusion of the existing servitude of the railway line is situated within two quaternary catchments of the Olifants River. The western part of the mining area falls within catchment B11B. An unnamed tributary of the Steenkoolspruit flows in a westerly direction across the farm Dorstfontein, towards the Steenkoolspruit. The Steenkoolspruit in turn flows north into the Olifants River. **Drainage pattern and runoff** The drainage pattern in the area is strongly influenced by the Olifants River to the north of the mining area. The streams on the western portion of the mining area flow west and north west into the Steenkoolspruit, which flows north into the Olifants River. The main stream on the eastern portion of the mining area flows north into the Olifants River. Some artificial dams are present on the mining area as a result of past cultivation activities. Water is shed as surface runoff whenever rainfall reaches the ground faster than it infiltrates the underlying soils. The volume and rate of surface run off is a factor of many variables including rainfall intensity, duration of rainfall and nature of soil and vegetation cover.
Groundwater	**Groundwater observation points in the study area** Groundwater levels and general characteristics were obtained from: • Privately owned boreholes in the study area; • Monitoring boreholes drilled specifically for the project to obtain site specific information; and • Springs and wetlands that occur in the area. **Groundwater quality** Hodgson & Krantz (1998) have analysed 41 weathered aquifer samples and 76 fractured aquifer samples in the Witbank Dam sub-catchment of the Olifants River. The weathered aquifer has a generally good water quality as the majority of leachable salts have been washed out of this aquifer by years of dynamic groundwater flow. This is reflected by the mean electrical conductivity of 13 mS/m (maximum is 25 mS/m). The fractured aquifer qualities exhibit higher conductivity values as a result of higher sulphate, magnesium and calcium concentrations. The mean electrical conductivity of 64 mS/m (maximum 145 mS/m) reflects this.
Wetlands	**Wetland delineation**

Specialist Study	Baseline Information
	The study area is located within the Olifants River Catchment (Primary Catchment B), and more specifically at the upper end (near the watershed) of the three quaternary catchments B 11 B, B 11 D, and B 11 E. The area receives an annual average rainfall of approximately 680 mm, of which on average 30mm ends up as run-off. **Wetland Ecological and functional status** The hillslope seepage wetlands and the unchannelled valley bottom wetlands on site are characterised by a mixture of grass and sedge species with typical species including *Kyllinga erecta, Cyperus marginatus, Fuirena sp., Paspalum dilatatum, Imperata cylindrica, Eragrostis curvula, Eragrostis gummiflua, Agrostis lachnantha, Agrostis montevidensis and Cynodon dactylon*. In the more disturbed areas, *Setaria pallidefusca, Paspalum urvillei, Tagetes minuta, Bidens formosa* and *Bidens pilosa* were common. Within the permanently wet areas of the channelled valley bottoms and along the edge of open water areas such as the dams and the pan, the more common species included *Leersia hexandra, Typha capensis, Eleocharis dregeana and Persicaria sp*. Numerous functions are typically attributed to wetlands, which include biodiversity support, nutrient removal (and more specifically nitrate removal), sediment trapping (and associated with this is the trapping of phosphates bound to iron as a component of the sediment), stream flow augmentation, flood attenuation, trapping of pollutants and erosion control. Many of these functions attributed to wetlands are wetland type specific and can be linked to the position of wetlands in the landscape as well as to the way in which water enters and flows through the wetland. **Present Ecological Status Assessment** All of the wetlands within the study area have been impacted upon to some degree. No pristine wetlands were found to occur within the study area. For the greater part of the study area the predominant land use surrounding the wetlands is agriculture, consisting of extensive areas of cultivation (mostly for maize and soya beans), as well as grazing for cattle. There is some evidence that these activities influence not only the vegetation but also the runoff characteristics of the landscape. In particular, cultivation within the wetland boundaries, especially the hillslope seepage wetlands, has impacted on the wetlands. The consequences of these changes in land use on wetlands is that most show signs of modification, but they, and the water that they reflect, continue to support wetland associated functions including biodiversity support, sediment trapping, water quality improvement and in the case of valley bottom systems, some degree of flood attenuation. **Ecological Importance and Sensitivity Assessment**

Specialist Study	Baseline Information
	The wetlands within the study area all form part of Upper Olifants River Catchment which has been greatly impacted upon by various activities, which include mining, power stations, water abstraction, urbanization, agriculture etc. As a result of these impacts serious water quality concerns and also water quantity concerns have been raised within the sub-catchment. Given this situation, and the fact that wetlands can support functions such as water purification and stream flow regulation, a high importance and conservation value is placed on all wetlands and rivers within the catchment that have as yet not been seriously modified. Added to this, the study site is located near the top end of three quaternary catchments, and as such, all water draining from these wetlands passes through the entire length of the quaternary catchments and its wetlands. Any impact experienced within these wetlands at the top of the catchment thus has the potential to also impact on the downstream reaches of the catchments.
Air Quality	The Expansion Project is situated in the Mpumalanga Highveld, and area which has recently been formally declared as a national air pollution hotspot in terms of Section 81(1) of the NEM:AQA, to be known as the “Highveld Priority Area”. The mine is situated in a high altitude region characterised by regular summer rains, but where the winters are cool, dry and windy, resulting in conditions ideal for the desiccation of the environment and the wind entrainment of any loose material. Areas most affected by dust from the mine will generally lie to the south of the site. Emissions to air during the construction and operation of a mine of this nature are generally limited to dust, smoke emissions from heavy machinery and vehicles, and a wide range of trace gases given off during the drying of solvents and similar processes resulting from activities associated with routine construction and maintenance. Of these, dust is by far the greatest potential polluter.
Sites of Historical and Cultural Importance	The proposed Project is located in the midst of a cultural landscape that is marked by heritage remains dating from the pre-historical into the historical (colonial) period. Stone Age and Iron Age sites as well as colonial and mining heritage remains therefore do occur in the Eastern Highveld. **<u>Heritage Resources within the DECM Expansion Project Area</u>** These heritage resources were mapped and geo-referenced, see Appendix S. The types and ranges of heritage resources that were discovered in the Expansion Project area are now briefly discussed and illuminated with photographs: *<u>Historical farmstead complexes-</u>* At least two historical farmstead complexes occur on Welstand 55IS in the project area. Both complexes are associated with infrastructure some with historical significance, and include the following: • Farmstead Complex 01; and

Specialist Study	Baseline Information
	• Farmstead Complex 02. *Graveyards-* Four informal graveyards were found as part of the initial archaeological study in the project area. They are the following: • Graveyard 01 (high significance); • Graveyard 02 (high significance).
Noise	The prevailing ambient noise levels in the study area is a mixture of sound pressure levels due to the location next to a provincial road, gravel road, farmland and a hill. The following are noise sources in the vicinity of the Expansion Project area: • Northern boundary; • Eastern boundary; • Southern boundary; and • Western boundary.
Vibrations and Blasting	Currently mining and limited blasting is only occurring on the farm Dorstfontein. As there is an underground mine and the area being undermined is sparsely populated agricultural lands, the effects of the vibrations are limited to the few farm houses and labourers dwellings in the area. No vibration monitoring or seismic monitoring is currently taking place, but a programme will be established prior to the commencement of mining in both the West and East Mines.
Visual Aspects	The DECM Expansion Project is located mostly within the existing mining operations, which tends to dominate the landscape characteristics of the immediate area around the project site and established sense of place of the study area. The expectation of visitors to the area and those persons travelling along the regional roads will therefore be of a mining area and not a pristine landscape devoid of human intervention. The existing complex is 5 km east of Ga-Nala (Kriel) and 0.5 km from the R547 main road. Most of the existing infrastructure is obscured from traffic and Ga-Nala (Kriel) and Thubelihle residents by the surrounding landscape, i.e. topography and vegetation. Components of the infrastructure with the highest visibility are the numerous stockpiles/waste dumps from the current mining operations in the area, and the disturbed surrounding environments of grazing and cultivated land.

Specialist Study	Baseline Information
Socio-Economic Conditions	The Mpumalanga Province has been synonymous with mining for a long period of time. There is approximately 217 mines across the province and in 2002 it was estimated that 60 000 people were employed in this industry in the province. Various mine closures in the Emalahleni Local Municipality, however, has led to various environmental problems and negative socio-economic impacts due to job losses. The population of the Emalahleni Local Municipality totals approximately 276 000 individuals. The study area falls within Ward 25, 26 and 27 with each a total population of 10 927, 5 718 and 11 076 respectively. The total population of these three wards (27 721) constitutes 10% of the total population of the Emalahleni Local Municipality. The general demand for farmland will continue to increase as it is a finite resource. The market price for farmland, as for any other real estate, is strongly influenced by the cost of capital. Although the market for farmland in South Africa experienced a growth period since 2001, it can be expected that the demand has in more recent times decreased due to the increase in the cost of capital. This situation is likely to prevail for the foreseeable future as it is unlikely that the Reserve Bank will in the short term decrease the repo rate. The main commodities in the area are maize (white and yellow), soya and beef (weaner calves). The market price for all three these commodities has increased considerably over the last few months, and it is expected that this upward move will probably continue due to a steady increase in demand. Although the market price has improved, the input costs have also increased, mainly driven by the international increase in the price of oil. As such, the profit margins for these commodities fluctuate, but it is highly unlikely that it will improve significantly in the long term. As such, the profitability of the farmland in the area is unlikely to improve in the foreseeable future.

Table 11-2: Baseline Information extracted from the EMP for the DECM Extension of Pit 1 (Ref No.: MP 30/5/1/2/3/2/1 (51) MR)

Specialist Study	Baseline Information
Geology	The coal reserves located at DECM 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.
Topography	The catchment consists of moderately hilly to flat areas. The proposed expansion of Pit 1 can be found at an elevation of 1 560 metres above mean sea level (mamsl) to the north and 1 600 mamsl to the south. The pipeline has an elevation of 1 560 mamsl at the Dorstfontein West and 1 540 mamsl at DECM.
Stakeholder Engagement	I&APs were consulted during the Scoping and EIA Phase. Site notices were placed on 5 May 2017. An advertisement was placed in the Witbank News on 5 May 2017. Copies of the Scoping Report were placed at the Kriel Public Library, DECM, and SRK Website. A public meeting was held on 31 July at the following venues and times during the Scoping Phase (Kriel High School – 10h00; and Impilo Primary School – 14h00).
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.
Biodiversity	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 HGM types, 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.

Specialist Study	Baseline Information
Surface water	DECM is situated in Quaternary catchments B11B 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.
Groundwater	<u>Aquifers, Hydrocensus and Groundwater Monitoring</u> DECM 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.
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; and • Biomass burning.
Noise	The ambient noise levels in immediate environment of the DECM 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.

Specialist Study	Baseline Information
Vibration	The evaluation of effects yielded by blasting operations was evaluated over an area as wide as a 3 500 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 (POIs)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.
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 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.
Socio-Economic	**Key Population Demographics** 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. **Socio-economic Profile**

Specialist Study	Baseline Information
	The employment rate in the study area (46.7%) is superior to both NDM (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.

This section comprises the baseline environment of the proposed Project area as assessed as part of this EIA Process. The purpose of understanding the environmental baseline conditions relates to the potential of the project to impact on the existing environment; and the potential for existing environmental aspects to influence a proposed development in terms of design, location, technology and layout.

A number of specialist studies were undertaken as part of the environmental regulatory process during the EIA phase for the proposed Project, as shown in Table 11-3 below.

Table 11-3: Specialist Reports and Associated Appendices

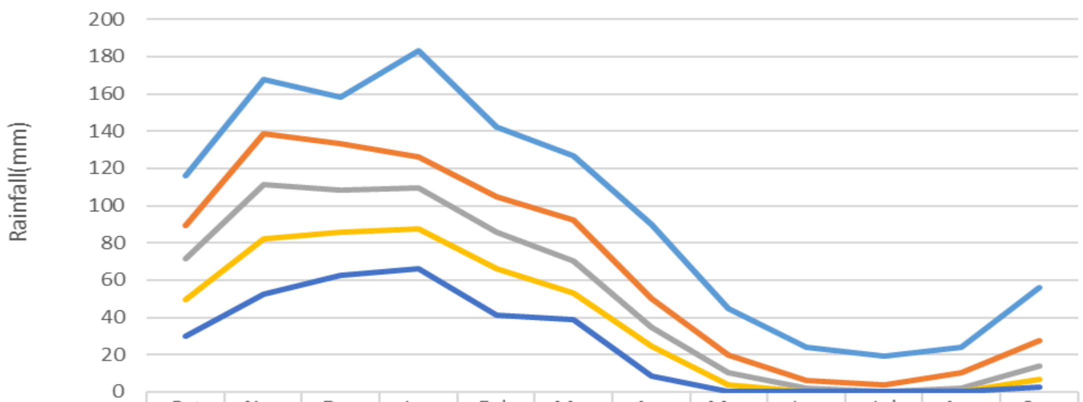
Specialist Study	Appendix
Soils, Land Use and Land Capability Assessment	Appendix D
Fauna and Flora Assessment	Appendix E
Wetland Assessment	Appendix F
Aquatic Ecology Assessment	Appendix G
Hydropedological Assessment	Appendix H
Surface water Assessment	Appendix I
Groundwater Assessment	Appendix J
Air Quality Assessment	Appendix K
Noise Assessment	Appendix L
Heritage Assessment	Appendix M
Visual Assessment	Appendix N
Traffic and Transport Assessment	Appendix O
Socio-economic Assessment	Appendix P
Greenhouse Gas Emissions Assessment	Appendix Q
Rehabilitation and Closure Assessment	Appendix R

11.1 Regional Climate

DECM falls within a semi-arid climate region of Southern Africa, where rainfall is sparse with high seasonal variations during wet and dry seasons. The wet (or rainy) season occurs during summer months, October to March and is characterised by short, intense convective storms. Such high rainfall contributes to significant parts of recharge into the aquifers (Braune and Xu, 2005). Dry seasons occur during wintertime (April - September) and are characterised by dry cold weather conditions. Governing the variation in seasonal rainfall is the latitudinal movement of the Inter-Tropical Convergence Zone, which migrates to the south of the equator during summer months and back to the north of the equator in winter.

11.1.1 Rainfall

The Project site is characterised by a temperate climate with cool dry winters and warm summers. The Mean Annual Precipitation (MAP) for quaternary catchments B11B is 688 mm The combined average MAP for the two (it should be one quaternary catchment) quaternary catchments is likely to be distributed as indicated in Figure 11-1. The normal rainfall (70% of events) for the wettest month (January) will likely not exceed 126 mm, while extreme rainfall (10% of the events) will likely not exceed 183 mm. This implies that the region experiences moderate to high rainfall.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
90 Percentile	116	168	158	183	143	127	90	45	24	19	24	56
70 Percentile	89	139	133	126	105	92	50	20	6	4	11	27
50 Percentile	71	111	108	109	86	70	35	10	2	0	2	14
30 Percentile	49	82	86	88	66	53	24	4	0	0	0	7
10 Percentile	30	53	63	66	41	39	9	0	0	0	0	3

Figure 11-1: Monthly Rainfall Distribution

11.1.2 Evaporation

The Mean Annual Evaporation (MAE) for the quaternary catchments B11B is 1587 mm and 1647 mm, respectively. The region experiences higher evaporation than precipitation, giving rise to dry winters and wet summers with a negative natural water balance. The average monthly distribution of potential evaporation and rainfall for both quaternary catchments can be seen in Figure 11-2.

Generally, evaporation exceeds mean annual rainfall by a factor of two times which could mean that rainfall recharge into the aquifer could only be possible in times where rainfall is high and evaporation rates are low. This is one of the major factors resulting in dry streams and also on low moisture fluxes recharge the aquifers.

11.1.3 Temperature

Temperature variation is seasonal. Average daily temperatures of approximately 27°C are experienced during summer months while average daily temperatures of approximately 4°C are experienced during the winter season. However, daily temperatures may reach up to 36°C in summer while minimum temperatures may fall below -4°C in winter.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation(mm)	169	160	176	173	144	142	156	92	75	82	108	140
Rainfall(mm)	72	111	110	115	91	76	42	17	8	6	7	23

Figure 11-2: Monthly Evaporation and Rainfall

11.2 Topography and Drainage

The topographical elevation of the Project area varies from 1 515 mamsl and 1 660 mamsl characterised with gentle slopes and low-lying areas, see Figure 11-3. The topography differs approximately by 50 m in elevation between the low laying areas (an unnamed tributary of the Steenkoolspruit) and the high lying ridge areas (approximately 1 660 mamsl). The high lying Klein Vaalkop forms the water divide between B11B quaternary catchment in the north-east and B11B in the south-west region, refer to Figure 11-3 below. The land undulates gently. There are four valleys present in the larger reserve area, namely:

- The unnamed tributary of the Olifants which flows in a westerly direction; and
- Three unnamed tributaries of the Olifants River, which drains in a northerly direction.

Two western Olifants tributaries overly the western limb of the reserve and the eastern tributary overly the eastern limb. The confluence of the three tributaries takes place on the farm Vlaklaagte 45 IS, just north of the mining concession area. The slopes of the valleys vary between 1:20 and 1:40. The topography between the two Olifants River tributaries is less prominent and can be characterised more as a plateau.

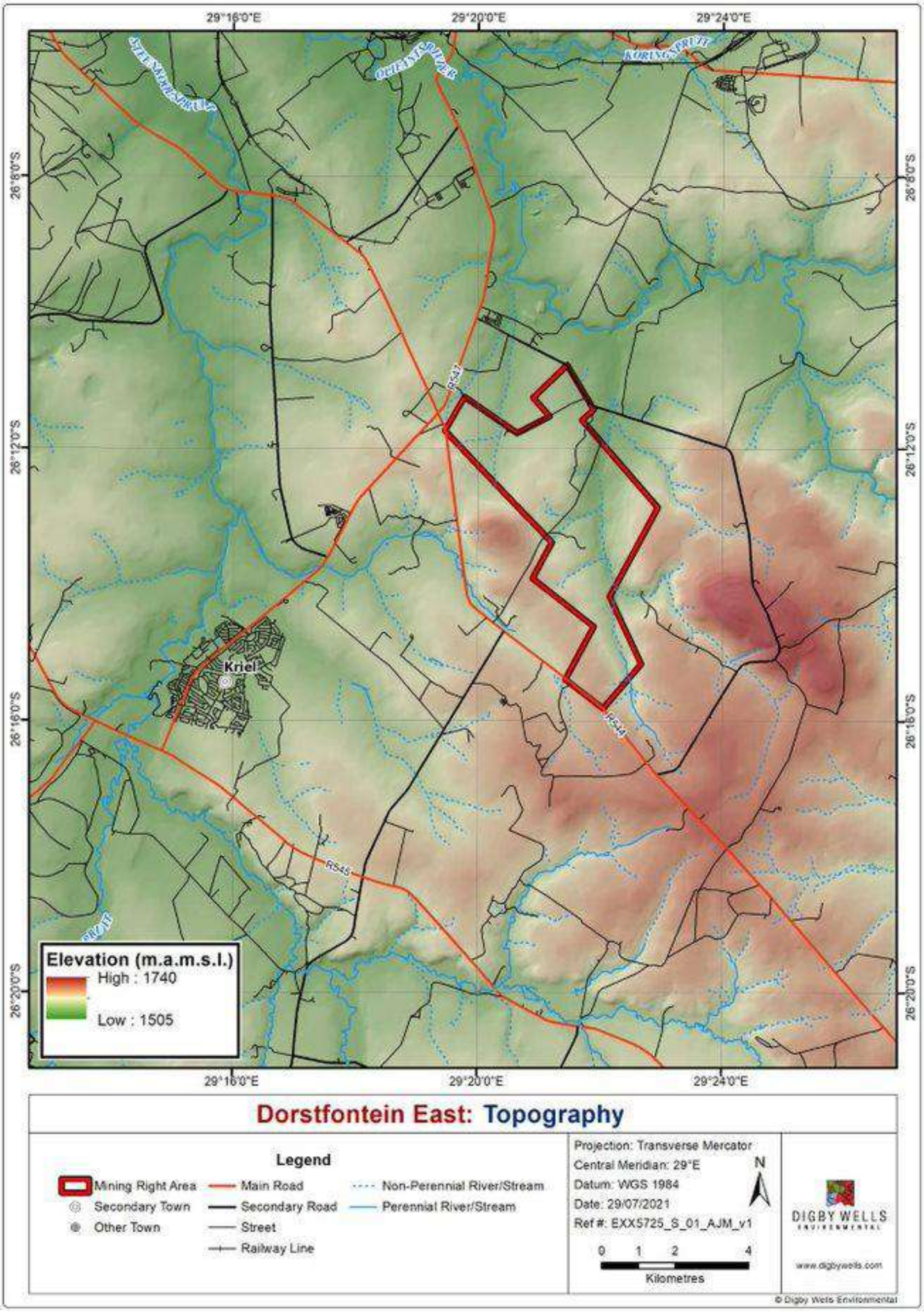


Figure 11-3: Regional Topography

11.3 Soils, Land Use and Land Capability

The field assessment for the Soil, Land Use and Land Capability Impact Assessment was undertaken in February 2020 to assess the soils, current land use and land capabilities. The baseline Soil, Land Use and Land Capability focusses mainly in the proposed Project area and is further discussed in Appendix D of this report. The subsections below provide a summary of the baseline findings.

11.3.1 Soil Chemical and Physical Characteristics

A total of ten representative soil samples were collected over the Project area to establish the baseline conditions of the soils before mining activities as well as to provide support for recommendations regarding soil and rehabilitation management. The results of the soil analysis for the samples taken during the February 2020 survey are presented in Table 11-5. As a basis for interpreting the data, Soil Screening Values (SSV) and local soil fertility guidelines are presented in Table 11-4 together with the pH guidelines.

Table 11-4: Soil Fertility Guidelines

<table>
<tr><th colspan="6">Guidelines (mg per kg)</th></tr>
<tr><th colspan="3">Macro Nutrient</th><th>Low</th><th colspan="2">High</th></tr>
<tr><td colspan="3">Phosphorus (P)</td><td><5</td><td colspan="2">>35</td></tr>
<tr><td colspan="3">Potassium (K)</td><td><40</td><td colspan="2">>250</td></tr>
<tr><td colspan="3">Sodium (Na)</td><td><50</td><td colspan="2">>200</td></tr>
<tr><td colspan="3">Calcium (Ca)</td><td><200</td><td colspan="2">>3000</td></tr>
<tr><td colspan="3">Magnesium (Mg)</td><td><50</td><td colspan="2">>300</td></tr>
<tr><th colspan="6">pH (KCl)</th></tr>
<tr><th>Very Acid</th><th>Acid</th><th>Slightly Acid</th><th>Neutral</th><th>Slightly Alkaline</th><th>Alkaline</th></tr>
<tr><td><4</td><td>4.1-5.9</td><td>6-6.7</td><td>6.8-7.2</td><td>7.3-8</td><td>>8</td></tr>
</table>

Table 11-5: Soil Physic-Chemical Properties

SSV	pH KCl	P Bray1	K AmAc	Na AmAc	Ca AmAc	Mg AmAc	CLAY	SILT	SAND	Texture Class	C WB	SOM
		mg/kg					%					
	Table 11-4	5 - 35	40 - 250	50 - 200	200 - 3000	50 - 300						
S1	4.18	4	105	17	182	49	18	8	74	Sandy Loam	0.59	1.02
S2	5.6	7	107	14	338	49	16	6	78	Sandy Loam	0.23	0.4
S3	4.54	10	64	26	239	37	18	5	77	Sandy Loam	0.33	0.56
S4	5.08	2	223	16	464	113	20	8	72	Sandy Clay Loam	1.06	1.82
S5	4.33	2	97	29	400	91	12	17	71	Sandy Loam	1.98	3.4
S6	5.98	12	67	17	479	58	18	7	75	Sandy Loam	0.46	0.79
S7	4.57	3	174	21	298	78	28	13	59	Sandy Clay Loam	1.21	2.08
S8	5.47	2	112	76	341	125	14	8	78	Sandy Loam	0.73	1.26
S9	5.33	2	54	60	351	472	28	16	56	Sandy Clay Loam	0.16	0.28
S10	5.28	7	57	15	263	78	20	7	73	Sandy Clay Loam	0.28	0.49

11.3.2 Soil pH

The pH of the soil samples collected ranged from 4.18 to 5.98, indicating that the soils are acidic. The acidic soils may be due to the acidic nature of the parent material where more alkaline soils can be attributed to the high levels of cations such as calcium (Ca^{+2}), magnesium (Mg^{+2}), potassium (K^{+}) and ammonium (HN^{+4}) in the soil.

For optimal crop production, the pH should range between 5.8 and 7.5. In soils with low pH, Aluminium (Al) becomes soluble, and crops may suffer from toxic levels of Al. In the soluble form, Al retards root growth, restrict nutrient and water update and produce smaller grain size and less yield. The pH of the soil can be improved by lime or gypsum additions.

11.3.3 Exchangeable Cations

The levels of the basic cations for the ten samples are indicated in Table 11-6. The results marked as green indicate that the value is below the SSV, whereas the results in red indicate that the value is above the SSV. The Potassium and Calcium levels indicate that the levels are sufficient for agriculture, however, the Sodium levels of most of the samples indicated to be low and would require the addition of Na to the soil for optimal crop production. The Magnesium levels of Samples 1 to 3 indicate insufficient levels and requires the addition of Mg to the soils, nevertheless, Sample 9 indicates levels above the SSV. However, small amounts of Mg will not particularly be harmful to crops.

Table 11-6: Exchangeable Cations

Sample	K	Na	Ca	Mg
	mg/kg			
SSV	40 - 250	50 - 200	200 - 3000	50 - 300
S1	105	17	182	49
S2	107	14	338	49
S3	64	26	239	37
S4	223	16	464	113
S5	97	29	400	91
S6	67	17	479	58
S7	174	21	298	78
S8	112	76	341	125
S9	54	60	351	472
S10	57	15	263	78

11.3.4 Phosphorus

The soil Phosphorous (P) levels were low (less than 5 mg/kg) for most of the samples when compared to the soil fertility guidelines, refer to Table 11-7. Low levels of P in soil may limit plant growth and cause weak, shortened stems with dark, bluish-green leaves. P is required in plants for root development and promote plant sugars for more efficient ripening of fruits and promote larger flowers. Fertilization is required to establish a good plant stand and growth. An excellent, natural source of phosphorus is cattle manure. Other sources of P include fertilizers such as NPK (a Nitrogen (N), P, and Potassium (K) commercial fertilizer blend) and superphosphate.

Depending on the clay content of the soil should phosphorus be applied to amend the P level of the soil. P levels in the soil are dependent on soil pH and depth as P is immobile in soil and will be higher at a depth where there is a free flow of water.

Table 11-7: Phosphorus Levels

Sample	P
	mg/kg
SSV	5 - 35
S1	4
S2	7
S3	10
S4	2
S5	2
S6	12
S7	3
S8	2
S9	2
S10	7

11.3.5 Soil Organic Carbon

Soil Organic Carbon (SOC) and SOM indicate organic matter content in the soil, therefore the soil fertility. Levels above 2-3% SOC are considered moderate to high according to du Preez *et al.* (2010).

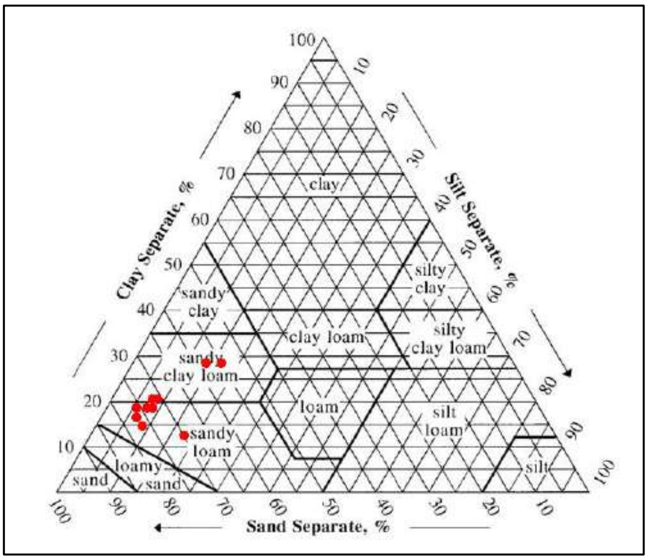
Sample	SOC	SOM
SSV	%	%
S1	0.59	1.02

Sample	SOC	SOM
SSV	%	%
S2	0.23	0.4
S3	0.33	0.56
S4	1.06	1.82
S5	1.98	3.4
S6	0.46	0.79
S7	1.21	2.08
S8	0.73	1.26
S9	0.16	0.28
S10	0.28	0.49

11.3.6 Soil Particle Size Distribution

The soil particle size distribution sampled were grouped into the percentages of sand, silt, and clay present. The textural classes were obtained from plotting the three fractions on the particle size distribution triangle indicated in Table 11-8.

Table 11-8: Soil Particle Size Distribution

Sample	Texture Class	
S1	Sandy Loam	
S2	Sandy Loam	
S3	Sandy Loam	
S4	Sandy Clay Loam	
S5	Sandy Loam	
S6	Sandy Loam	
S7	Sandy Clay Loam	
S8	Sandy Loam	
S9	Sandy Clay Loam	
S10	Sandy Clay Loam	

Soil water retention characteristics are strongly affected by soil texture. Higher clay content results in greater water retention. Similarly, the higher the sand fraction, the less water is retained by the soil (Gebregiorgis, 2003). Soil macropores allow a greater volume of water to drain more rapidly than would be expected from a soil that is dominated by clay fractions. Generally, the ideal pore space is between 40 – 60% (NRCS-USDA, 2013).

The bulk density of soil is dependent on the sand-clay-silt ration. The higher the clay content the higher the bulk density. Bulk density represents the mass of dry soil (mass of solids) per unit volume of soil (White, 2003). A low bulk density implies a favourable soil structure for root penetration as it is not compacted (Karuku, et al., 2012). Generally, soils with bulk densities greater than 1.6 g/cm^{-3} are considered as compacted soils (Twum & Nii-Annang, 2015).

11.4 Fauna and Flora

The Fauna and Flora Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix E. This section discusses, in detail, the findings of the flora and fauna assessment conducted by Digby Wells in April 2021 during the EIA Phase. Due to access limitations and restrictions, the time of the survey was not conducted during the ideal flowering time (wet season from December to January) and various properties within the Project area were inaccessible. Together, these limitations may have hindered species data collection as some flowering species would have been missed.

11.4.1 Flora

The field investigation that was conducted by Digby Wells concluded that the vegetation habitats within the Project area include, grasslands, wetlands and modified areas.

11.4.1.1 Wetland Systems

A large proportion of the project area constitutes wetlands. The wetland systems and associated drainage lines provide basis for the trophic chain as well as essential ecological corridors for faunal movement. Continuous biomonitoring of the wetlands is recommended to identify the deterioration factors and provide mitigation measures to prevent further degradation of the systems. There are five HGM Units (wetlands) identified and described by the Digby Wells Wetland Report (DWE, 2021) are listed below as:

- Channelled Valley Bottom (CVB);
- Pan;
- Pan Seep;
- Seep; and
- Unchannelled Valley Bottom.

The location of the wetlands is depicted in Figure 11-4. Numerous faunal and floral species were encountered within the delineated wetlands. The CVB wetland in the eastern portion of the Project area had evidence of high faunal activity.

Wetlands are highly sensitive habitats due to their levels of biodiversity and sensitivity to disturbances, they are highly ecologically important as they host numerous faunal assemblages and habitat for floral species.

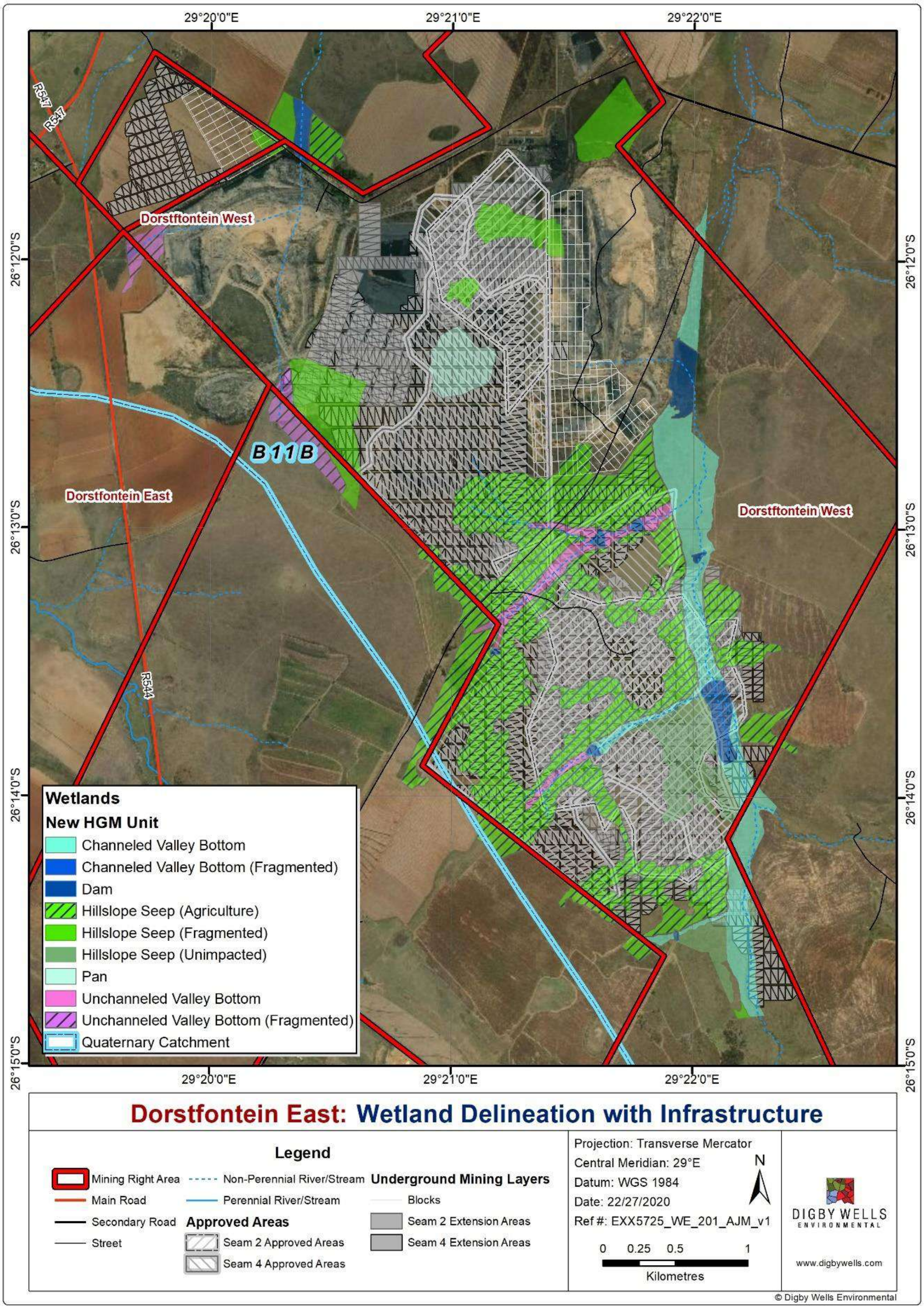


Figure 11-4: Wetland Delineations within the DECM

11.4.1.2 Transformed Habitat

Transformed land refers to areas that have been changed or disturbed to such an extent that all-natural habitats, biota and ecosystem functions have been fragmented or lost. The transformed areas within the Project area were predominantly due to the agricultural practises and cultivation of maize/corn (*Zea mays*) and soybean (*Glycine max*) which constitutes the majority of the western portion of the study area. The current land use practices have completely altered the landscape and has permitted AIPproliferation and loss of sensitive habitats, such as wetlands and the existing natural grassland, namely the Eastern Highveld Grassland (Endangered) (Mucina & Rutherford, 2012).

11.4.1.3 Grassland

As majority of the Project area has been subjected to anthropogenic (agriculture) activities, the remaining grasslands are broadly defined as Secondary grasslands. Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (such as cultivated areas) but have then been allowed to return to a 'grassland' state and left to fallow, allowing a few grassland species to pioneer. Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning, and the ecosystem services they deliver (SANBI, 2013).

Secondary Grassland	
Photographic representation	 Typical secondary grassland area within the study site

Secondary Grassland	
Description of area	The secondary grasslands are distinguishable from the primary grasslands in their notable depleted diversity. They generally miss resprouting species and do not respond in the same way as natural grasslands to fire disturbances. They also have a much lower below-ground root biomass compared to the high below-ground root biomass of natural grasslands. The impacts associated with ploughing disturbances can be observed both above and below the ground (Zaloumis, 2013).
Current condition	The secondary grasslands had evidence of loosened topsoil, previous ploughing and AIPs. The dominance of *Serphium plumosum* is indicative of overgrazed grasslands (see image above). Previously burnt grasslands showed signs of soil erosion as they have a lower establishment of plants to hold the soil intact when faced with high levels of water runoff. Forb species composition was very low and graminoid homogeneity was high in comparison to primary grasslands.
Species of Conservation Concern	No floral SCC were encountered in the secondary grasslands
Common species	Dominant grasses included *Eragrostis curvula, Eragrostis gummiflua,* and *Themeda triandra.* Pioneering forbs and AIPs included *Conyza bonariensis* (AIP), *Gomphocarpus fruticosus, Pseudognaphalium luteoalbum* and *Solanum pandiforme* (AIP).
Images	 Secondary grassland adjacent to Maize field

11.4.1.4 Exotics

Previous natural grasslands have been altered and/or transformed and have been replaced by pioneering AIP shrubs, trees and forbs. Table 11-9 below lists all AIPs recorded and their respective NEM:BA Status Category.

Table 11-9: AIPs Recorded in the Project area

Species	Category[2]
*Acacia mearnsii**	2
Amaranthus viridus	Invasive
Bidens pilosa	Invasive
*Campuloclinium macrocephalum**	1b
Chenopodium alba	Invasive
*Cirsium vulgare**	1b
Cosmos bipinnatus	Invasive
Conyza bonariensis	Invasive
*Datura stramonium**	1b
*Equisetum hyemale**	1a
*Eucalyptus camaldulensis**	1b
Oenothera rosea	Invasive
Paspalum notatum	Invasive
*Persicaria capitata**	1b
*Persicaria lapathifolia**	Invasive
*Portulaca quadrifida**	Invasive
*Pseudognaphalium luteoalbum**	Invasive
Richardia brasiliensis	Invasive
*Schkuhria pinnata**	Invasive
*Solanum panduriforme**	Invasive
*Solanum sisymbriifolium**	1b
*Sonchus oleraceus**	Invasive
Tagetes minuta	Invasive

[2] *In accordance with the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Alien and Invasive Species List, 2020

Species	Category[2]
*Tragopogon dubis**	Invasive
*Verbena bonariensis**	1b
*Verbena officinalis**	Invasive
*Veronica anagallis-aquatica**	Invasive

11.4.2 Fauna

This section represents the results from the field survey conducted during April 2021.

11.4.2.1 Mammals

A total of 10 mammals were recorded during the infield assessments. The mammal species were encountered and observed throughout the Project area within the various habitat units. Various mammals of the Herpestidae (Mongoose) family were observed throughout the numerous wetlands. Tracks of a Water Mongoose were observed throughout the numerous CVB wetlands. Numerous sightings of Scrub Hare were recorded throughout the Project area. Numerous Aardvark burrows were observed in the seep areas, and adjacent to CVB that flows through the eastern portion of the site. Porcupine, Water Mongoose, and Serval were observed through tracks associated with muddy areas of the CVB. Serval is listed as Near Threatened according to the Regional Red List Assessment of the IUCN. A list of all mammals recorded in the Project area is presented in Table 11-10 below.

Servals are found in many protected areas within South Africa and are included on CITES Appendix II and protected under national legislation (TOPS regulations) (SANBI, 2018). It is listed as Least Concern (LC) globally and Near Threatened (NT) nationally on the IUCN Red List. Effective conservation of Serval depends on the conservation of wetlands, particularly wetlands in fragmented landscapes. Wetlands form a micro habitat in a mosaic of farmland for several wetland-dependent species; they are reservoirs of small mammal populations that are major dietary components of Servals. Consequently, if wetlands are protected in a mosaic of farmland use, the landscape may support the persistence of Serval populations.

Table 11-10: Mammals recorded in Project area

Family	Species	Common Name	Conservation status
Bovidae	*Sylvicapra grimmia*	Bush Duiker	LC
Felidae	***Leptailurus serval***	**Serval**	**NT**
Herpestidae	Atilax paludinosus	Water Mongoose	LC
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC

Family	Species	Common Name	Conservation status
Muridae	*Otomys angoniensis*	Angoni Vlei Rat	LC
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	LC
Orycteropodidae	*Orycteropus afer*	Aardvark	LC
Sciuridae	*Xerus inauris*	Ground Squirrel	LC

11.4.2.2 Birds

Birds are viewed as good ecological indicators, as their presence or absence tends to represent conditions of a functioning ecosystem. The direct link between bird diversity and land cover portrays a direct indication of the habitats in the area of interest.

According to the SABAP2 database, over 140 species of birds have been identified in the area (see Appendix B). The majority of these birds are comprised of grassland and waterbird species. Sixty-two birds were recorded during the field assessment in April 2021. It should be noted that April is not an ideal bird viewing frame as many wading birds may have been missed due to the late season observation. The identified birds are listed in Appendix E. Numerous pans were scattered throughout the project area and hosted many waterfowl including Egyptian Geese, Grey Herons, Reed Cormorant, Yellow-billed Ducks, Red Knobbed Coots, Cormorants, Egrets, and Red-billed Teals. A Marsh Owl (*Asio capensis*) was identified within the study area, see Figure 11-5.

Figure 11-5: Marsh Owl flushed during site work

11.4.2.3 Herpetofauna

During the field assessment, three amphibian species were identified within the wetland, and pans, via its call and by direct sightings. The Delalande's River Frog (*Amietia delalandii*), Bubbling Kassina (*Kassina senegalensis*) and the Boettger's Caco (*Cacosternum boettgeri*) (all Least Concern) were recorded within the wetlands.

Reptiles are notoriously difficult to comprehensively detect during short field surveys, due to many species in this group naturally occurring at low densities and being inherently illusive. One species of reptile were identified, namely Speckled Rock Skink (*Trachylepsis punctatissima*). The Skink was encountered basking on the outcrops of the sandstone sheaths. The remaining grassland and wetland habitats provide both hunting sites and shelter for herpetofauna, primarily amphibians colonizing the wetlands which in turn attracts reptile predators.

The observed species diversity for both reptiles and amphibians was considerably low.

11.4.2.4 Invertebrates

During the field assessment in April 2021, a total of 19 invertebrates were identified and are listed in Table 11-11 below. Various species of the Nymphalidae family were recorded despite the survey being conducted during Autumn.

Table 11-11: Invertebrate species recorded

Family	Species	Common name	Conservation status
Acrididae	*Locustana pardalina*	Brown Locust	LC
Carabidae	*Lophyra sp*	Tiger Beetles	LC
Coccinellidae	*Harmonia axyridis*	Asian Lady Beetle	LC
Coenagrionidae	*Africallagma glaucum*	Swamp Bluet	LC
Coenagrionidae	*Africallagma sapphirinum*	Saphire Bluet	LC
Coreidae	*Cletus sp.*	Leaffooted bug	LC
Crambidae	*Spoladea recurvalis*	Beet Webworm	LC
Libellulidae	Urothemis assignata	Red Basker	LC
Libellulidae	*Trithemis strictica*	Jaunty Dropwing	LC
Lycosidae	*Hogna spenceri*	Wolf Spider	LC
Melyridae	*Astylus atromaculatus*	Spotted Maize Beetle	LC
Nymphalidae	*Byblia ilithyia*	Spotted Joker	LC
Nymphalidae	*Hypolimnas misippus*	Diadem	LC
Nymphalidae	*Vanessa cardui*	Painted Lady	LC

Family	Species	Common name	Conservation status
Pentatomidae	*Nezara viridula*	Green Vegetable Bug	LC
Platycnemididae	*Elattoneura glauca*	Common Threadtail	LC
Syrphidae	*Allagrapta fuscotibialis*	Hoverfly	LC
Tettigoniidae	*Conocephalu caudalis*	Meadow Katydid	LC
Tingidae	*Plerochila australis*	Olive Lace Bug	LC

11.5 Wetlands

The Wetland Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix F. A site visit was conducted from 10 to 12 September 2019 to assess the ecological integrity, delineate the wetlands, and determine their PES, ES and EIS state.

11.5.1 Wetland Delineation and Hydrogeomorphic Unit Identification

During the desktop and field assessment, 565.8 ha of wetlands were identified and delineated within the Project area using the approved methodology by the (Department of Water Affairs and Forestry, 2005). As per the most recent proposed surface infrastructure and underground mine plan, surface infrastructure is not planned within any delineated wetlands; however, are within 100 m of a wetland (HGM 1 and 7) (Table 11-12). Twenty-four HGM units and eight dams were identified and categorized based on terrain units. These include depressions (pans), hillslope seep wetlands (Seeps), unchanneled valley bottom wetlands (UVBs), and channelled valley bottom wetlands (UVBs). Land use activities and in-field studies have shown that some of the systems are similar from a catchment management perspective as they would be subject to similar overall land uses impacts. Therefore, it was considered practical to group the HGM units by systems that have similar land use and impacts to calculate more accurate PES and EIS scores. Eight HGM units were identified and assessed. The extent of the combined HGM units together with the total percentage of wetlands within the Project area are indicated below (Table 11-12).

Table 11-12: Combined HGM Units

No.	Name	Acronym	Area (Ha)
1	Pan	Pan	15.9
2	Channelled Valley Bottoms	CVBs	90.9
3	Channelled Valley Bottoms (fragmented)	CVBs Fragmented	4.4
4	Unchanneled Valley Bottoms	UVBs	17.0
5	Unchanneled Valley Bottoms (fragmented)	UVBs Fragmented	19.3
6	Hillslope Seep (Agriculture)	HS Agriculture	293.6

7	Hillslope Seep (Fragmented)	HS Fragmented	66.9
8	Hillslope Seep (Unimpacted)	HS Unimpacted	39.6
Total wetlands			**547.6**
*	Artificial wetlands, dams and borrow pits	Dams	18.2
Total area			**565.8**

* Artificial wetlands, dams and borrow pits are not regarded as HGM units, however, it is included in the calculations due to forming part of other HGM units and affecting the PES and EIS scores

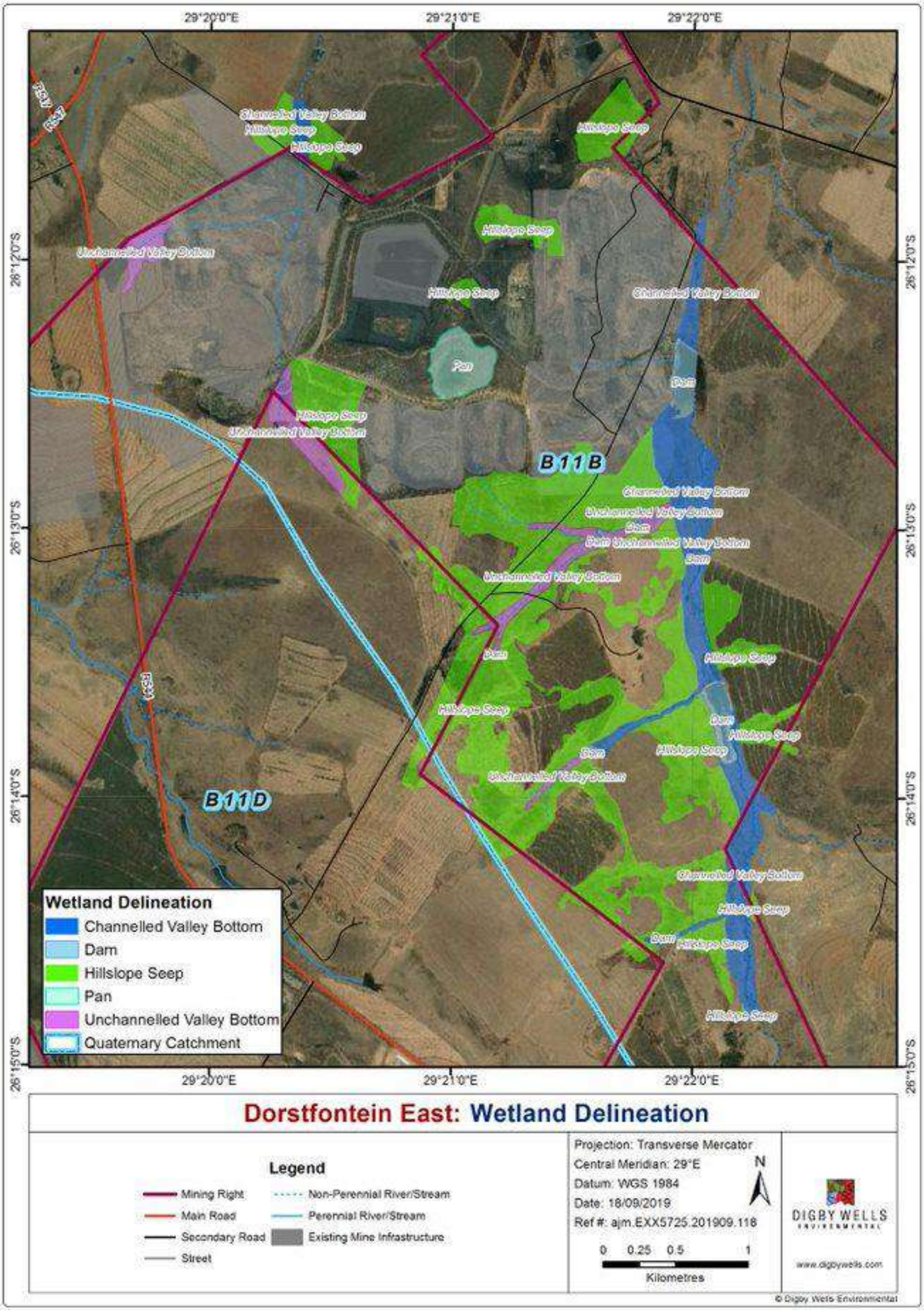


Figure 11-6: Wetland Delineations

11.5.1.1 Terrain Indicator

The terrain unit indicator was used extensively in the identification of wetlands and their various HGM units. Use was made of topographical maps and five-meter contours in the preliminary identification of wetland areas. Further to this, the underlying geology and geohydrology of the area were investigated to gain a greater understanding of the potential movement of subsurface water and potential areas of daylighting.

Wetlands in the crest and mid-slope were typically characterized as Seeps and UVBs. A pan wetland was identified within the currently mined area. Wetlands in the middle slope, foot-slope, and bottomland typically identified as VBs. Scattered dams and a large dam within the main CVB on the east of the Project area were identified. These dams are typically used for irrigation, cattle watering, and domestic use.

Some of the wetlands were unimpacted by direct mining and agricultural activities, whereas some wetlands were almost completely mined out, fragmented, or cultivated.

Figure 11-7: Terrain Indicators

11.5.1.2 Vegetation Indicator

Vegetation structures of the various wetlands and their respective HGM units were relatively variable. Large portions of the natural vegetation structures had been historically altered due to the predominant surrounding land use activities. These included areas of land cleared for crops and the use of the land for grazing and pastures.

Wetland plant species used in the identification and delineation of the various HGM units observed included the species listed in Table 11-13.

Table 11-13 Vegetation Indicators

Species type	Location	Example
Obligate wetland species	OWS	*Agrostis lachnantha*, *Leersia hexandra, Phragmites australis, Paspalum distichum.*

Species type	Location	Example
Facultative wetland species	FWS	*Andropogon eucomis, Hemarrthria altissima, Hyparrhenia tamba, Paspalum urvillei.*
Seasonal wetland species	SWS	*Setaria sphacelata, Aristida junciformis, Themeda triandra, Eragrostis gummiflua.*
Temporary wetland species	TWS	*Imperata cylindrica, Paspalum dilatatum*
Mostly wetland dependant species	MWS	*Typha capensis, Juncus* sp., *Cyperus* sp., *Persecaria* sp.

Stands of *Euca*lyptus *grandis* and *Pinus patula* were identified within the Project area. Isolated areas of *Acacia mearnsii* were also observed. It is regarded as likely that these areas may have resulted in serious modifications to historically wet or moist grasslands, VBs, pans, and seeps, thus influencing the wetland delineation at these points.

Figure 11-8: Vegetation Indicators

11.5.1.3 Soil Indicator

Soil indicators including soil forms and soil wetness, such as mottling and gleying of soils, were used extensively throughout the Project area to identify and confirm wetlands.

According to the Soil Study (Digby Wells, 2020), low-lying areas within the Project area showed increased clay content and soil wetness (Figure 11-9). These soils were identified as wetland soils (hydromorphic soils) and are saturated for long periods with a fluctuation water table, changing the morphology of the soils. The land use in these areas were generally wetlands and used for cattle grazing and perennial grasslands. These soils are somewhat limited for cultivation and highly mobile (high erosion probability).

Hydromorphic soils are significant to the overall site sensitivity analysis. The low angled topographic slopes and resulting wide expansive drainage lines coupled with the presence of restrictive sedimentary layers (sandstone predominantly) have resulted in proportionately much larger areas of transition zone moist grasslands and wet based soils that meet the wetland classification both pedologically as well as ecologically.

Figure 11-9: Soil Indicators

11.5.2 Wetland Ecological Health Assessment

The PES of the HGM units were assessed in 2019. The PES of the eight HGM units were rated to have an ecological state of **'Moderately Modified'** to **'Largely Modified'** (Table 11-14 and Figure 11-10). According to the integrity (health) method described by Kotze et al. (2007):

- A **category C** wetland has **Moderate** changes to its ecosystem processes, and loss of natural habitat has taken place; however, the natural habitat remains predominantly intact; and
- A **category D** wetland has **Large** modifications to the natural ecosystem processes and loss of natural habitat and biota.

Each HGM unit, PES score, and its health; hydrological, vegetation, and geomorphological health are tabulated below (Table 11-14) whereas the validations for the PES values are discussed below.

Table 11-14: Present Ecological State Scores

Number	HGM Unit Group	Hydrology	Geomorphology	Vegetation	Combined PES	PES Category
1	Pan	6.0	2.0	4.1	4.3	D
2	CVBs	7.0	1.4	5.9	5.1	D
3	CVBs Fragmented	4.0	4.0	5.4	4.4	D
4	UVBs	2.0	0.5	6.2	2.8	C

Number	HGM Unit Group	Hydrology	Geomorphology	Vegetation	Combined PES	PES Category
5	UVBs Fragmented	3.0	0.3	7.8	3.6	C
6	HS Agriculture	2.0	0.6	9.0	3.6	C
7	HS Fragmented	4.0	1.2	7.5	4.2	D
8	HS Unimpacted	1.0	0.2	7.0	2.5	C

11.5.2.1 Validation (2019)

Pan (D) – The pan is located within the mine operational area. The entire catchment as well as the pan has been impacted by mining activities, changes to the hydrological functioning, increased AIPs, and excavations, and dumping was evident within the pan. Ecological functioning has been highly impacted by dominantly mining activities.

Channelled Valley Bottoms (D) – The CVBs have mainly been impacted by agropastoral activities, including cattle grazing, dams, and cultivation. Large dams exist within the CVB, together with evidence of cattle trampling, erosion, and compaction. This impacted the natural hydrology, ground cover, and changes to the natural vegetation.

Channelled Valley Bottoms (fragmented) (D) – In addition to the aforementioned, some of the CVBs have been fragmented by linear infrastructure, including mining activities, agropastoral activities as well as roads, powerlines, and fence lines. Fragmentation of wetlands impacts the natural habitat, functionality, and health of a wetland. Linear infrastructure within wetlands is prone to creating erosion, channelling, drying out of wetlands, and increased AIPs.

Unchanneled Valley Bottoms (C) – The UVBs within the Project area were dominantly used for cattle grazing. There were no clear signs of channelling, erosion, or extensive cattle trampling. The vegetation was stable with little changes to water inputs to the systems. The systems were in a stable condition, well-functioning, and creating habitat for various fauna and flora species.

Unchanneled Valley Bottoms (fragmented) (C) – Regardless of some of the UVBs being moderately impacted, some of the systems were fragmented by mining, agropastoral and linear infrastructure. Dams were also indicated in some of the systems. The fragmentation of the UVBs changes the natural habitat and health of the systems.

Hillslope Seep (Agriculture) (C) – The majority of the Hillslope Seep wetlands were used for agropastoral activities, including commercial cultivation and cattle grazing. The soils within Hillslope Seep wetlands (Hutton, Clovelly) are typically used for cultivation due do the decent water-holding-capacity, fertility, and soil depth. However, cultivation changes the natural vegetation, hydrological functioning as well as the geomorphology by ploughing, ripping, and tillage.

Hillslope Seep (Fragmented) (D) – Regardless of some Hillslope Seeps being impacted by agropastoral activities, some of the seeps have been impacted by mining activities and linear infrastructure, including roads, dams, and powerlines. Some sections of the seeps have almost completely been removed by these activities or completely separated and cut off from the rest of the system.

Hillslope Seep (Unimpacted) (C) – Unimpacted Hillslope Seep wetlands were recorded within the Project area. These wetlands were mainly used for cattle grazing, however, was well regulated and little erosion and impacts on the vegetation and geomorphology were noted.

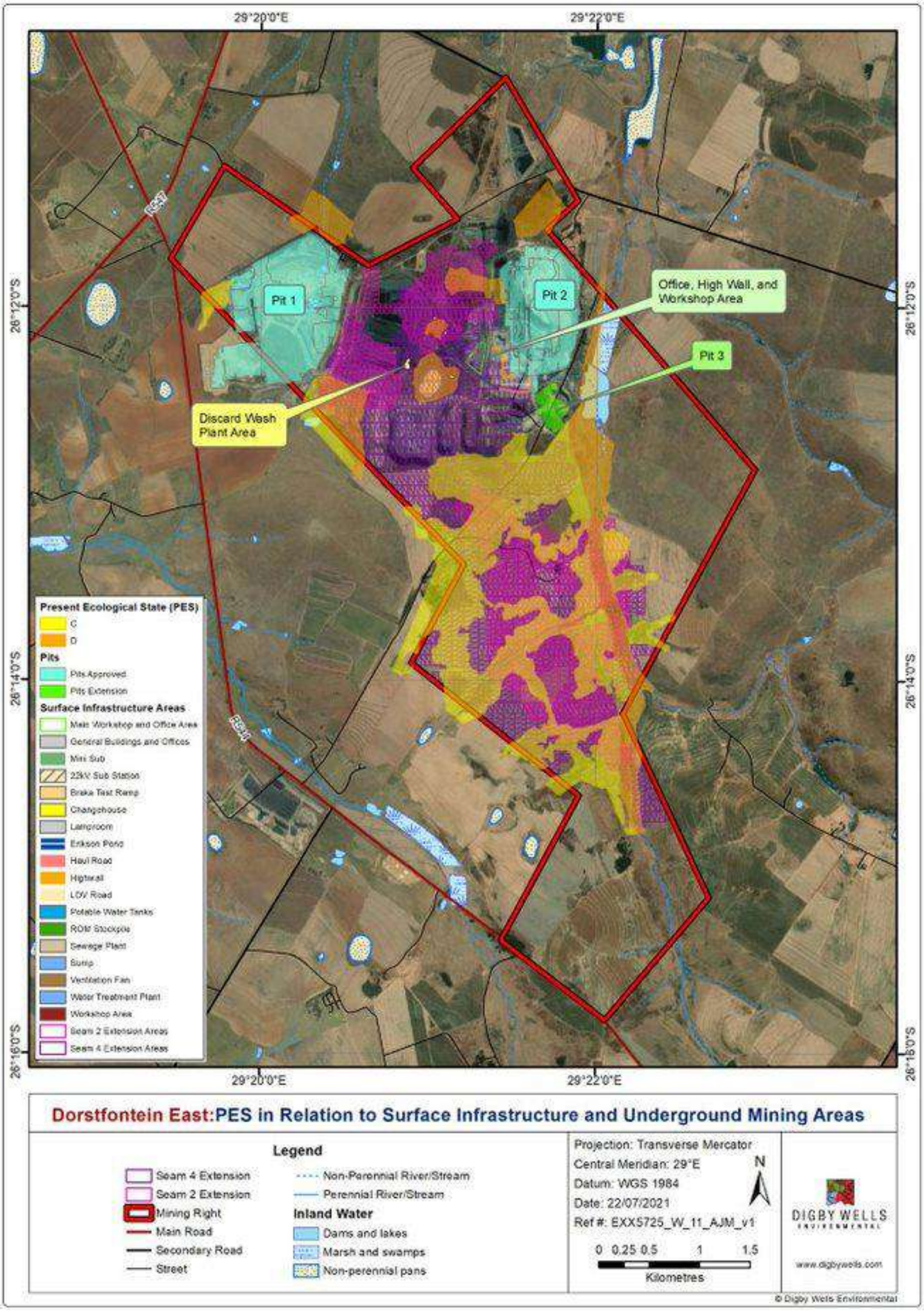
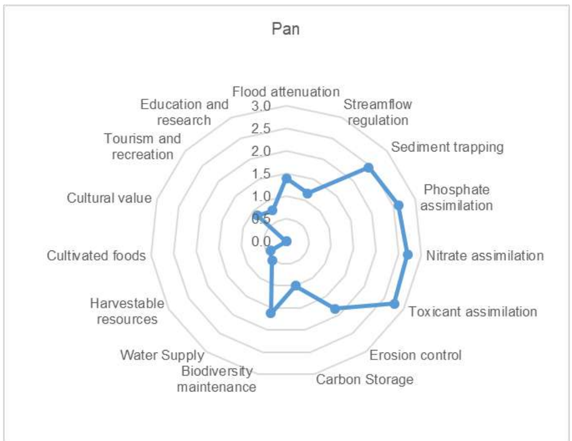
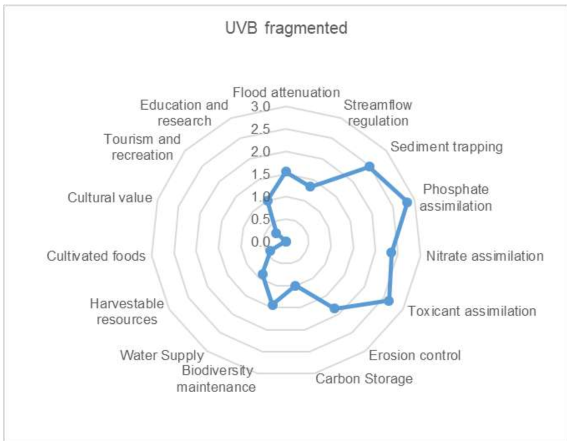
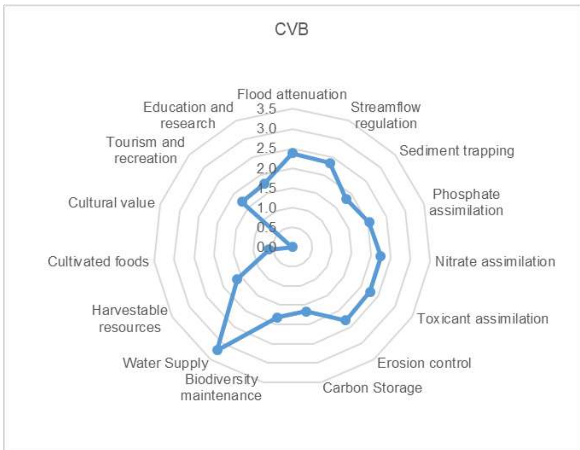
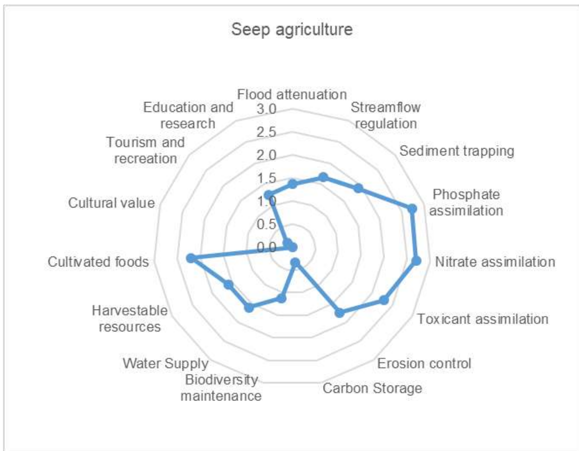


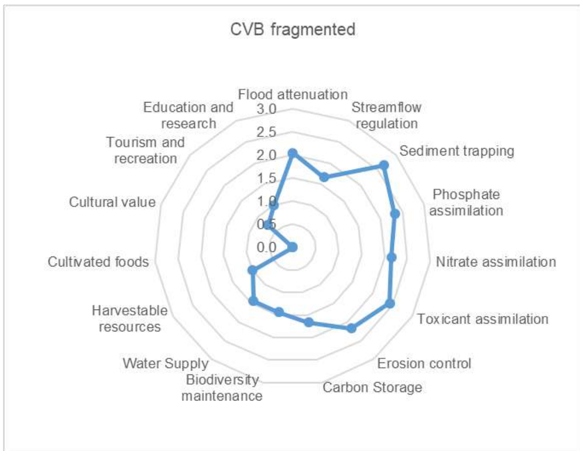
Figure 11-10: Wetland Present Ecological State

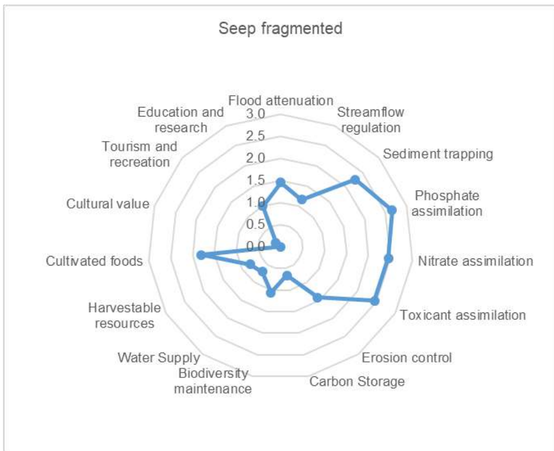
11.5.3 Wetland Ecological Services

The general ES and natural features of the wetlands were assessed in terms of functioning and the overall importance of each HGM unit was determined at a landscape level. Figure 11-11 represents radial plots showing the relative importance of each ecosystem service and lists the summary of the scores obtained.

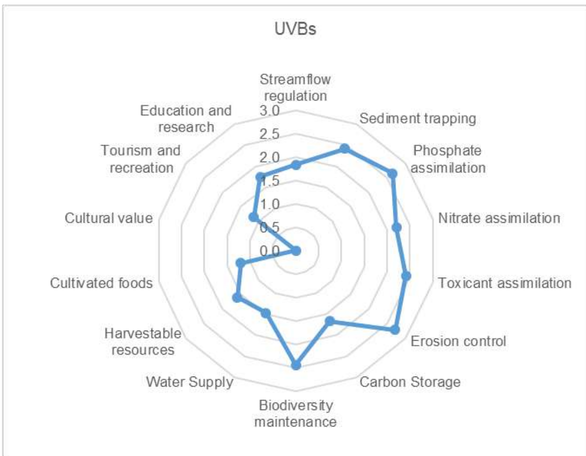
As indicated in Figure 11-12, Figure 11-11 and Table 11-15, sediment trapping, phosphate assimilation, nitrate assimilation, and toxicant assimilation are the dominant ecological services provided by the HGM units. The unimpacted Hillslope Seeps and CVBs are providing biodiversity maintenance due to the fauna and flora importance. The CVBs are important for water supply, supplying all agropastoral activities in the area (dams, cattle, irrigation, domestic use).

<table>
<tr><th>Pan</th><th>Unchanneled Valley Bottoms (fragmented)</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>Channelled Valley Bottoms</th><th>Hillslope Seep (Agriculture)</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>Channelled Valley Bottoms (fragmented)</th><th>Hillslope Seep (Fragmented)</th></tr>
</table>





Unchanneled Valley Bottoms | **Hillslope Seep (Unimpacted)**



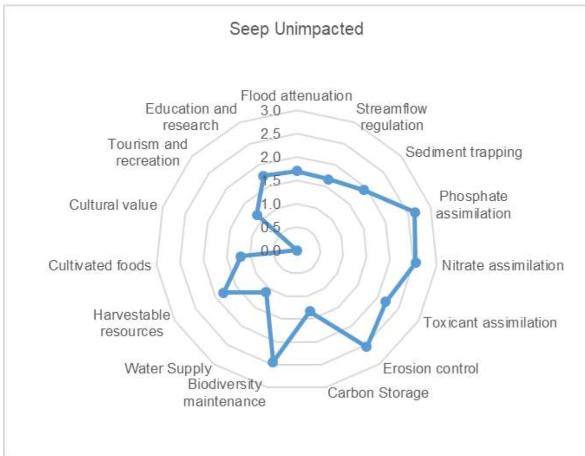


Figure 11-11: Ecoservices Radial Plots

Table 11-15: Ecological Services Scores

	1	2	3	4	5	6	7	8
Ecosystem service	**Pan**	**HS fragmented**	**UVB fragmented**	**CVB fragmented**	**HS agriculture**	**HS unimpacted**	**UVBs**	**CVB**
Flood attenuation	1.4	1.5	1.6	2.1	1.4	1.7	1.9	2.4
Streamflow regulation	1.2	1.2	1.3	1.7	1.7	1.7	1.8	2.3
Sediment trapping	2.5	2.3	2.5	2.7	1.9	1.9	2.4	1.8
Phosphate assimilation	2.6	2.7	2.8	2.3	2.7	2.7	2.6	2.0

	1	2	3	4	5	6	7	8
Ecosystem service	**Pan**	**HS fragmented**	**UVB fragmented**	**CVB fragmented**	**HS agriculture**	**HS unimpacted**	**UVBs**	**CVB**
Nitrate assimilation	2.7	2.5	2.4	2.2	2.7	2.6	2.2	2.3
Toxicant assimilation	2.8	2.5	2.6	2.4	2.3	2.2	2.4	2.3
Erosion control	1.8	1.4	1.8	2.2	1.8	2.5	2.7	2.3
Carbon Storage	1.0	0.7	1.0	1.7	0.3	1.3	1.7	1.7
Biodiversity maintenance	1.6	1.1	1.4	1.4	1.1	2.4	2.4	1.8
Water Supply	0.5	0.7	0.9	1.4	1.6	1.1	1.5	3.2
Harvestable resources	0.4	0.8	0.4	1.0	1.6	1.8	1.6	1.6
Cultivated foods	0.0	1.8	0.0	0.0	2.2	1.2	1.2	0.6
Cultural value	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tourism and recreation	0.9	0.1	0.3	0.7	0.1	1.1	1.1	1.7
Education and research	0.8	1.0	1.0	1.0	1.3	1.8	1.8	1.8
SUM	**20.1**	**20.0**	**20.0**	**22.7**	**22.7**	**26.0**	**27.4**	**27.8**
Average score	**1.3**	**1.3**	**1.3**	**1.5**	**1.5**	**1.7**	**1.8**	**1.9**
	Intermediate	**Intermediate**	**Intermediate**	**Intermediate**	**Intermediate**	**Intermediate**	**Intermediate**	**Intermediate**

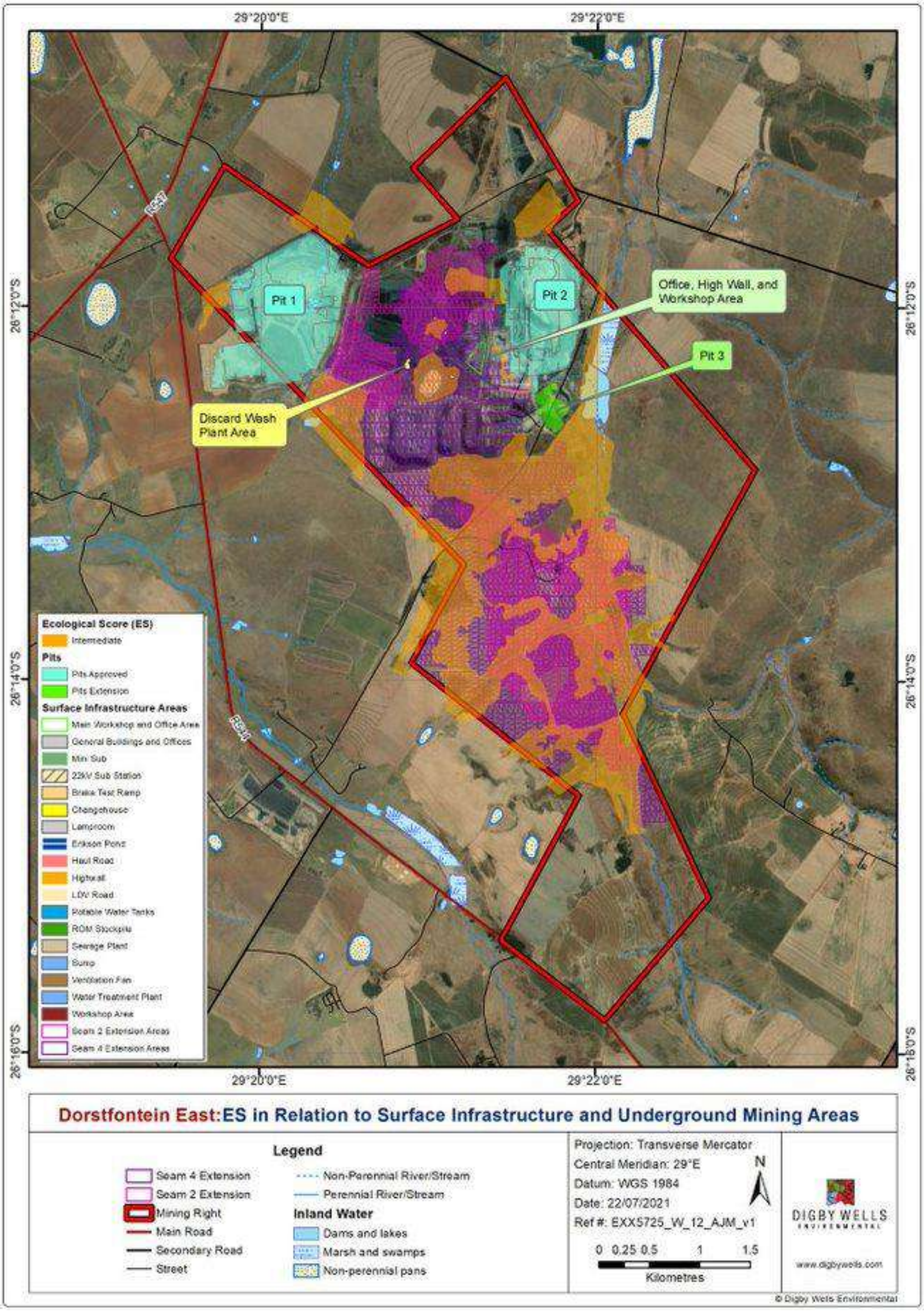


Figure 11-12: Wetland Ecological Services

11.5.3.1 Ecological Importance and Sensitivity

The EIS of a wetland is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Ecological sensitivity refers to the wetland's ability to resist disturbance and is the capability to recover from disturbance that has occurred (DWAF, 1999). Table 11-16 and Figure 11-13 indicates each HGM unit group and EIS Category.

The following was derived from the data:

- The Pan, UVBs Fragmented, HS Agriculture, and HS Fragmented were regarded as **'Moderate (C)'**. This specifies that the wetlands are ecologically important, however sensitive on a provincial and local scale. The integrity and biodiversity of these wetlands are sensitive to low flow and habitat modifications as a result of decades of mining, agriculture, and the introduction of AIPs. These wetlands play a small role in moderating the quantity and quality of water; and
- The CVBs, CVBs Fragmented, UVBs, and HS Unimpacted were considered **'High (B)'**. This suggests that these systems are of ecological importance and are sensitive. The biodiversity of the systems is sensitive to modifications to the habitat and low flows. These systems play an important role in moderating the quality and quantity of water in larger systems.

The HGM units assessed play an important role in moderating the quantity and quality of water of major rivers and tributaries. However, the river system has been modified by anthropological activities, specifically mining and agropastoral activities. The outcomes are changes in the water input volumes and pattern as well as water distribution and retention patterns of water passing through the wetlands. Additionally, linear infrastructure, such as roads, power lines, and fences change runoff and stormwater as well as causing fragmentation of the natural habitat. Agricultural deposits in a form of phosphates and nitrates using fertilisers or pesticides decrease the quality of water in the wetlands. Roads that have been built within the wetlands increases run-off from these hardened surfaces.

Table 11-16: Ecological Importance and Sensitivity Scores

HGM Number	HGM Unit	Ecological Importance & Sensitivity	Hydrological/Functional Importance	Direct Human Benefits	Final EIS	EIS Category
1	Pan	1.3	1.9	0.4	1.9	**Moderate (C)**
2	CVBs	1.8	2.1	1.5	2.1	**High (B)**
3	CVBs Fragmented	1.7	2.1	0.7	2.1	**High (B)**
4	UVBs	2.3	2.2	1.2	2.3	**High (B)**

HGM Number	HGM Unit	Ecological Importance & Sensitivity	Hydrological/Functional Importance	Direct Human Benefits	Final EIS	EIS Category
5	UVBs Fragmented	2.0	2.0	0.3	2.0	**Moderate (C)**
6	HS Agriculture	1.3	1.8	1.1	1.8	**Moderate (C)**
7	HS Fragmented	1.7	1.8	0.7	1.8	**Moderate (C)**
8	HS Unimpacted	2.3	2.1	1.2	2.3	**High (B)**

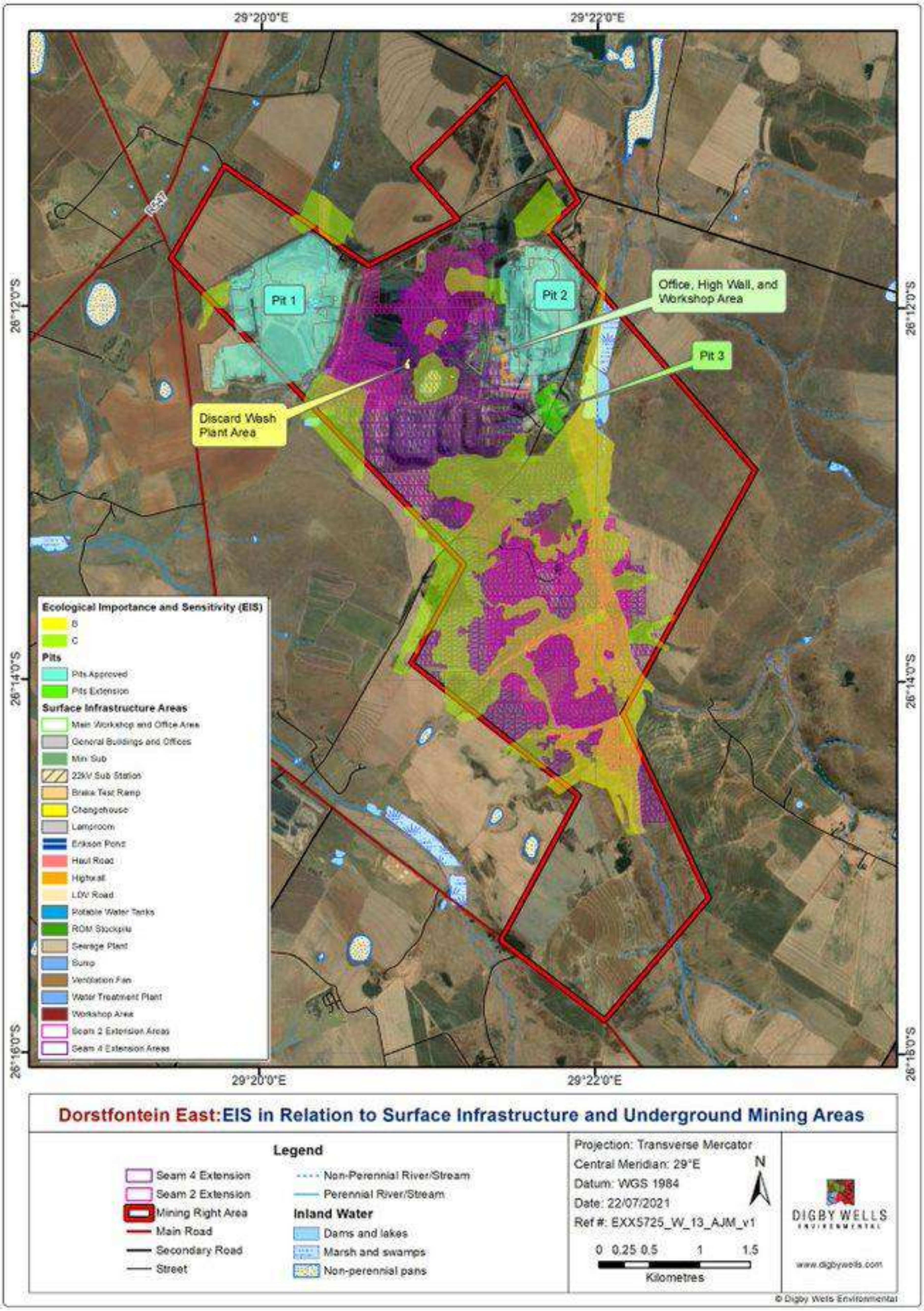


Figure 11-13: Wetland Ecosystem Importance and Sensitivity

11.5.4 Sensitivity Mapping

The 100 m buffer and 500 m zone of regulation in terms of GN R1199 were assessed to indicate sensitive areas that will require a WUL if any proposed infrastructure falls within these areas. Figure 11-14 indicated the existing infrastructure as well as proposed infrastructure areas.

According to the DECM Layout Plan (Figure 11-14), no wetlands fall within the proposed surface infrastructure area; however, the pan and Seep (HGM 1 and 7) fall within the 100 m Zone of Regulation. Figure 11-15 illustrates the wetlands in relation to the proposed underground mining activities and the surface infrastructure. All the wetlands delineated in the Project area fall within the proposed underground mining activities areas.

Based on the PES, ES and EIS analysis of the wetlands, the following was derived (Table 11-17 and Figure 11-14, Figure 11-15 and Figure 11-16).

Table 11-17 Sensitive Area

HGM Unit Number	HGM Unit	PES	ES	EIS	Sensitivity
1	Pan	D	1.3	1.9	**Low**
2	CVBs	D	1.3	2.1	**Medium**
3	CVBs Fragmented	D	1.3	2.1	**Medium**
4	UVBs	C	1.5	2.3	**High**
5	UVBs Fragmented	C	1.5	2.0	**High**
6	HS Agriculture	C	1.7	1.8	**Medium**
7	HS Fragmented	D	1.8	1.8	**Low**
8	HS Unimpacted	C	1.9	2.3	**Medium**

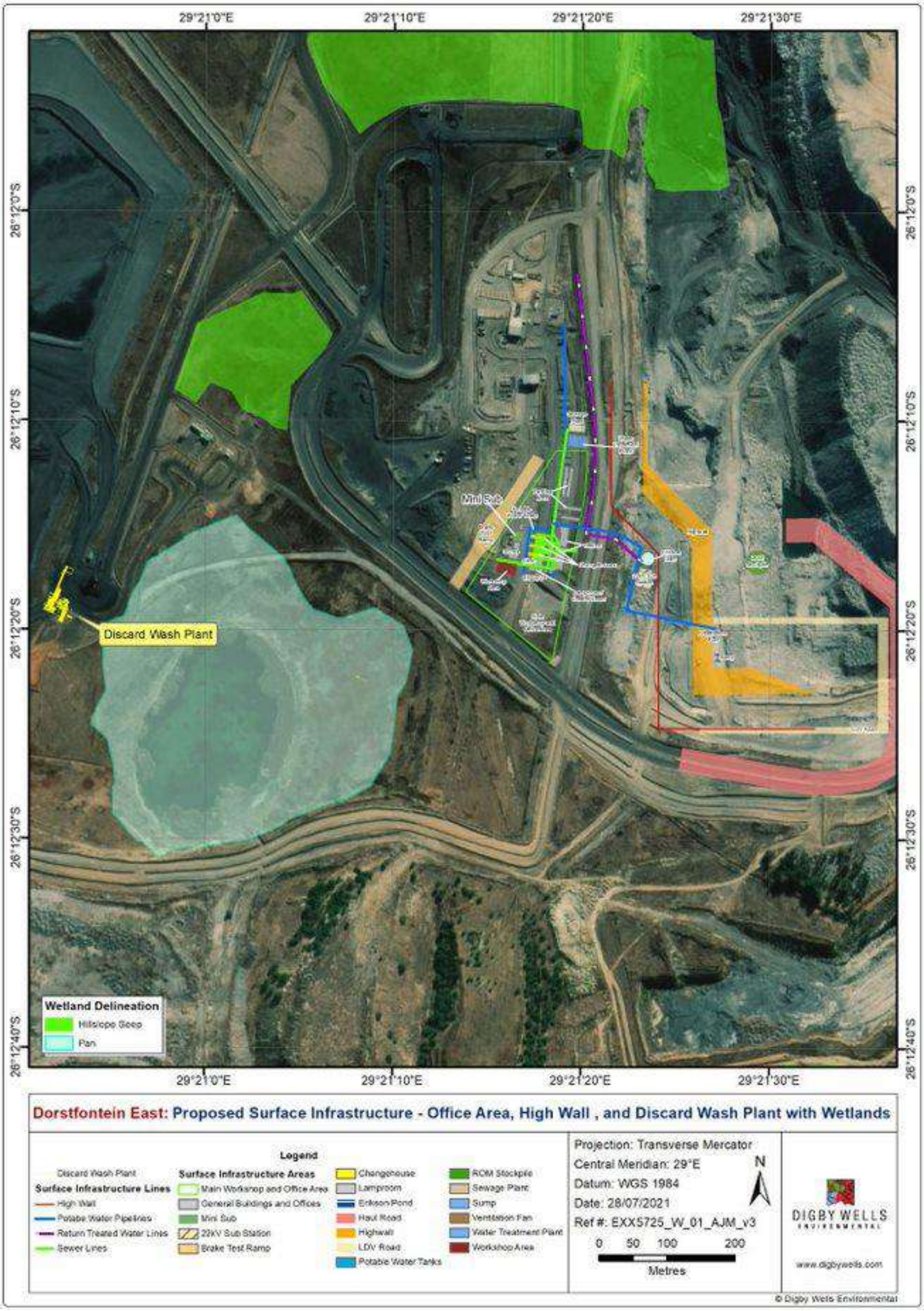


Figure 11-14: Wetland Delineation with Proposed Infrastructure

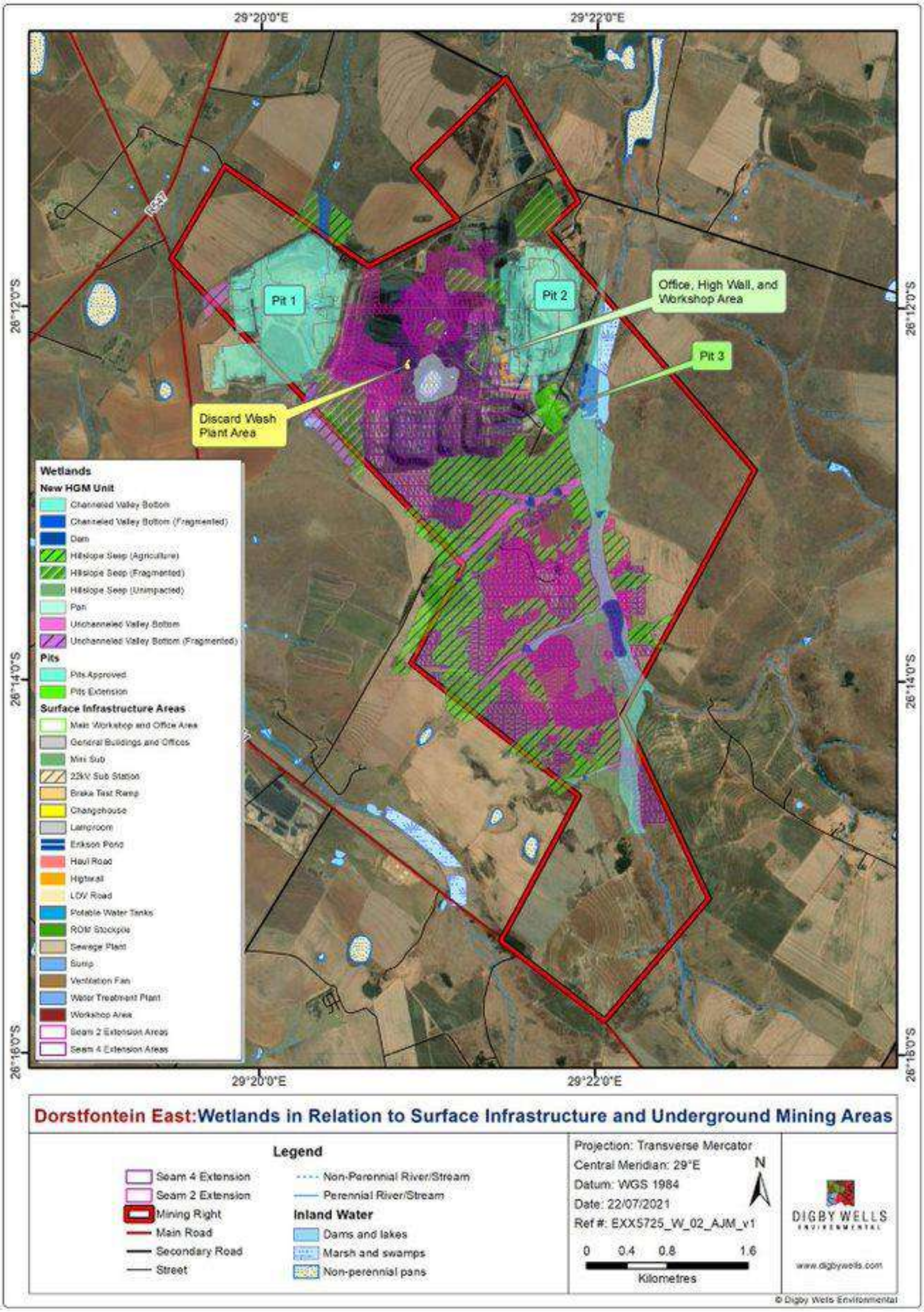


Figure 11-15: Wetlands in Relation to Proposed Surface Infrastructure and Underground Mining Areas

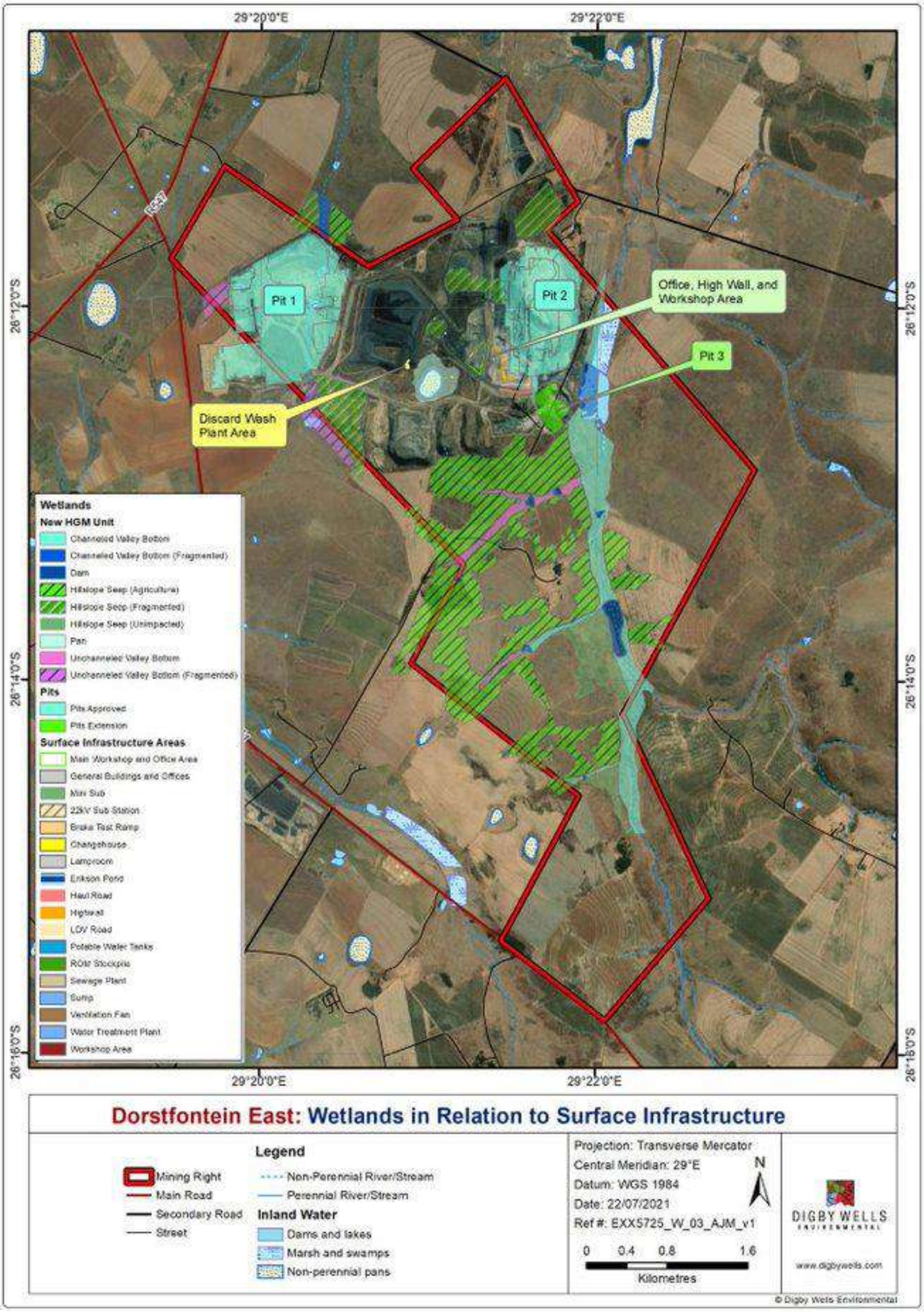


Figure 11-16: Wetland Delineations on Relation to Surface Infrastructure

11.6 Aquatic Ecology

The Aquatic Ecology Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix G. The findings for the September 2019 survey have been detailed in the respective subsections below. It should be noted that the Western Tributary of the Olifants and the Steenkoolspruit tributary are not expected to be impacted by the proposed activities as the watershed appears to drain towards the north-east and as such, were not included in the following sections.

11.6.1 *In situ* Water Quality

Selected *in situ* water quality parameters were measured at each of the identified monitoring sites prior to sampling. The results of the *in situ* water quality assessment are provided in Table 11-18 for the Olifants River and the Eastern Tributary of the Olifants.

Table 11-18: *In situ* water quality parameters recorded within the Olifants River and associated tributary

Site	Eastern tributary of the Olifants		Olifants River			Guideline Values
	ETO1	ETO2	O1	O2	O3	
Temperature (˚C)	18.7	DRY	17.2	22.2	20.6	5-30
pH	**8.80**		**9.68**	**9.31**	**9.17**	6-8
Conductivity (µS/cm)	**882**		**505**	**703**	**844**	<500
Red values indicate constituents exceeding recommended guidelines for aquatic life						

For the purposes of the current assessment, each of the values recorded at the time of the survey were compared against various water quality guidelines originating from the following sources:

- Temperature and pH guidelines obtained from Department of Water Affairs and Forestry (1996); and
- Conductivity guideline value of 500 µS/cm stipulated in U.S. Environmental Protection Agency (2010).

For the ease of interpreting the water quality data gathered for the various assessed ecosystems, the results have been separated for each considered reach for the relevant assessments where applicable.

11.6.1.1 Eastern Tributary of the Olifants

It should be noted that Site ETO2 was dry at the time of sampling, thus *in situ* findings for Site ETO1 only are discussed. Water temperature was recorded within the normal temperature range for rivers in South Africa (Department Of Water Affairs And Forestry, 1996), therefore aquatic biota was not expected to be deterred due to temperature. Recorded pH and conductivity levels were however above the recommended guidelines (Department Of Water Affairs And Forestry, 1996; U.S.EPA 2010).

The recorded pH level was slightly alkaline (pH 8.8), this was likely as a result of the natural process of photosynthesis, wherein the removal of CO_2 alters with the carbonate/bicarbonate equilibrium resulting in elevated levels of pH. This was also evidenced by the observed presence of algae along the river reach (Figure 11-17). The algae was also an indication of mild eutrophication possibly facilitated by agricultural runoff from the adjacent crop cultivation, which could also be linked to the recorded elevated conductivity level (882 µS/cm) (Department Of Water Affairs And Forestry, 1996). Furthermore, the system was observed to be incised and eroded.

Figure 11-17: Algae along the Eastern Tributary of the Olifants at the time of the survey

11.6.1.2 Olifants River

Along the Olifants River, pH levels were alkaline (ranging from pH 9.17 at Site O3 to pH 9.68 at Site O1), thus the pH was recorded above the recommended guideline (Department Of Water Affairs And Forestry, 1996). Similarly, conductivity levels were elevated and recorded above the recommended guideline at all the sites (Department Of Water Affairs And Forestry, 1996). Conductivity values ranged from 505 µS/cm at Site O1 to 844 µS/cm at Site O3.

Similar to the Eastern Tributary of the Olifants, the assessed main stem Olifants River reaches appeared to be impacted by nutrient enrichment, which was evidenced by the presence of excessive algae at the time of the survey (Department Of Water Affairs And Forestry, 1996;

Divya, 2012). Both systems are suspected to be impacted by the surrounding agricultural activities through surface run-off of nutrients/fertilizers.

Nonetheless, the pH levels recorded during the current survey were not expected to notably deter the presence of sensitive aquatic biota (Department of Water Affairs and Forestry, 2009).

11.6.2 Aquatic and Riparian Habitat

Assessment of aquatic habitat was based largely on the application of recognised assessment indices at each of the selected sampling points within the assessed watercourses, namely the Index for Habitat Integrity (IHI). The IHI is a rapid, field-based, visual assessment of modifications to a number of pre-selected biophysical drivers (i.e. semi-quantitative) used to determine the Present Ecological State (PES, or Ecological Category) of associated instream and riparian habitats.

11.6.2.1 *Index for Habitat Integrity*

The IHI was completed on a desktop level for each aquatic ecosystem considered in the Study and populated with observations recorded during the field survey (Table 11-19).

Table 11-19: Index for Habitat Integrity for the Dorstfontein East study area

Assessed Reach	Habitat Component	IHI Score	Ecological Category
Olifants Eastern Tributary	Instream	54.9	D
	Riparian	61.2	C
Olifants River	Instream	67.3	C
	Riparian	65.2	C

The findings from the IHI assessments conducted indicate that the habitat components ranged from *Largely Modified* (Ecological Category D) to *Moderately Modified* (Ecological Category C) within the Study Area. In general, the main modifications to the assessed reaches of the Olifants River are of agricultural and mining origin. Water abstraction, flow modification, water quality and inundation as a result of the farming practices and mining activities.

The riparian habitat was categorised as *Moderately Modified* (Ecological Category C) at the assessed reaches largely due to activities of agricultural origin. Farmlands have replaced and encroached on pre-existing habitat, resulting in a loss of riparian species. Additionally, damming of the system has resulted in inundation of mainly the upper reaches. It appears that this has also resulted in a replacement of typical woody riparian plant species to more wetland suited grass species (DWS, 2014).

11.6.3 Aquatic Macroinvertebrate Assessment

The following sections provides insights into the available habitat that was sampled at each respective monitoring sites at the time of the current survey, as well as the South African

Scoring System (SASS, Version 5) metrics obtained and the subsequent determination of the ecological condition of the observed assemblages in relation to reference conditions.

11.6.3.1 Invertebrate Habitat Assessment System

The Invertebrate Habitat Assessment System (IHAS, Version 2.2), developed by McMillan (1998), has routinely been used in conjunction with the South African Scoring System (SASS) as a measure of variability in the quantity and quality of representative aquatic macroinvertebrate biotopes available during sampling. However, according to a study conducted within the Mpumalanga and Western Cape regions, the IHAS method does not produce reliable scores with regards to the suitability of habitat for aquatic macroinvertebrates at assessed sampling sites, as its performance appears to vary between geomorphologic zones and biotope groups (Ollis *et al*., 2006). While no final conclusion can be made regarding the accuracy of the index until further testing has been conducted, these potential limitations and/or shortfalls should be noted.

Nevertheless, due to the value of basic habitat assessment data and its suitability for comparison of available macroinvertebrate habitats between various sampling sites, an adapted IHAS approach (exclusion of the surrounding physical stream condition) was maintained during the interim period (Table 11-20).

Table 11-20: Invertebrate Habitat Assessment System findings for the Aquatic Study

Sampling Site	IHAS Score (%)	Interpretation
Eastern Tributary of the Olifants		
ETO1	40	Poor
ETO2	DRY	
Olifants		
O1	40	Poor
O2	35	Poor
O3	29	Poor

All of the results for the IHAS conducted for the sampling sites classified the available macroinvertebrate habitat as ‘Poor’. Sites at the Olifants River reach as well as the Eastern Tributary of the Olifants were mostly dry with sections of pooled water (Figure 11-18). The sampled sites were dominated by shallow, still and/or slow-flowing water and a lack of the stones biotope was a common feature throughout the sites.

Figure 11-18: Pooled Water observed along the Unnamed Eastern Tributary of the Olifants River

11.6.3.2 Benthic Communities and Composition

Due to their differential sensitivities, the composition of aquatic macroinvertebrates can provide an indication of changes in water quality and other conditions within a watercourse. The use of the SASS has undergone numerous advances, culminating in Version 5 presently being utilised in river health studies along with the application of the Macroinvertebrate Response Assessment Index (MIRAI). However, it should be noted that the application of these indices within non-flowing/wetland systems should be used with caution, as these assessment indices were primarily designed to be used exclusively within riverine systems. Nevertheless, these methods were deemed to be sufficient for monitoring purposes within the associated channelled systems despite their potential limitations, as the primary intention was to standardise the monitoring approach. SASS5 data collected within the study area is presented in Table 11-21.

Within the Olifants river reach, the highest SASS5 score was obtained at the most upstream Site O1, followed by Site O3, then Site O2 with the least SASS5 score. However, the Average Score Per Taxon (ASPT) at Site O3 was the lowest of all, indicating that the sampled assemblage predominantly consisted of less sensitive taxa compared to Site O2. The lower SASS score obtained at the site immediately below mining areas suggests impacts associated with mining activities in addition to agricultural activities.

The aquatic macroinvertebrate community assemblages were predominantly composed of taxa that have "Low" water quality requirements. Of the collected invert families, only eight families with a "Moderate" water quality requirement (i.e. SASS sensitivity score of 7-11), thirteen with a "Low" requirement and fourteen with a "Very Low" requirement were collected throughout the sampled sites. The highest scoring taxa, Polymitarcyidae and Dixidae (SASS score of 10) were both collected at the Olifants Site O1.

Table 11-21: SASS5 Scores Recorded During the September 2019 Survey

Sampling Site	SASS5 Score	No. of Taxa*	ASPT**
Eastern Tributary of the Olifants			
ETO1	107	25	4.28
ETO2	DRY		
Olifants			
O1	137	28	4.89
O2	57	12	4.75
O3	75	17	4.41
*Number of individual macroinvertebrate families sampled; **Average Score per Taxon			

11.6.3.3 Ecological Condition of the Aquatic Macroinvertebrate Assemblages

Although Chutter (1998) originally developed the SASS protocol as an indicator of water quality, it has since become clear that the SASS approach gives an indication of more than mere water quality, but also a general indication of the current state of the macroinvertebrate community. While SASS does not have a particularly strong cause-effect basis for interpretation, the aim of the MIRAI is to provide a habitat-based cause-and-effect foundation to interpret the deviation of the aquatic macroinvertebrate community (assemblage) from the reference condition (C. Thirion, 2008). This does not preclude the calculation of SASS scores, but encourages the application of MIRAI assessment, even for the River EcoStatus Monitoring Programme (REMP) purposes, as the preferred approach.

It is preferred to apply the MIRAI on a reach-based level by incorporating macroinvertebrate findings at several sites which have similar aquatic conditions along the same watercourse. The lack of connectivity along the Eastern Tributary and the Olifants River systems at the time of the survey did not suit a reach based MIRAI approach. Therefore, a site-based approach has been adopted for both river reaches.

Before interpreting the MIRAI findings for sites sampled within the Olifants River reach, it should be noted that the determined scores were based solely on the presence or absence of macroinvertebrate families within the site. Not all families are expected to be frequent within the entirety of the reach. Therefore, the overall Ecological Category could be negatively skewed as "missed" taxa may be present within additional sites along the watercourse. Nonetheless, the MIRAI scores for the relevant metric groups categorised the macroinvertebrate assemblage at sites O1 and O2 as *Largely Modified* (Ecological Category D) and *Seriously Modified* (Ecological Category E) at Site O3 (Table 11-22).

At the Eastern Tributary Site ETO1, MIRAI findings indicate that the macroinvertebrate assemblage within the assessed reach was in a *Largely Modified* state (Ecological Category D).

Table 11-22: MIRAI Findings for The Assessed Sites

Site	MIRAI Value	Ecological Category	Description
Eastern Tributary of the Olifants			
ETO1	52.9	D	Largely Modified
ETO2	DRY		
Olifants			
O1	54.1	D	Largely Modified
O2	41.4	D	Largely Modified
O3	35.4	**E**	Seriously Modified

In general, flow modifications metrics appear to be largely responsible for the determined scores, resulting in a loss of flow dependent taxa from the reaches. The non-perennial nature of these systems coupled with the farm dams appear to be altering with the flow. Additionally, modifications to water quality and habitat also appear to be greatly driving the macroinvertebrate assemblage in the lower reaches of the Olifants River. This was also seen in the IHAS scores wherein the lower Olifants reaches scored the lowered.

11.6.4 Ichthyofaunal Assessment

The use of fish as a means to determine ecological disturbance has many advantages (Zhou et al., 2009). Fish are long living, respond to environmental modification, continuously exposed to aquatic conditions, often migratory and fulfil higher niches in the aquatic food web. Therefore, fish can effectively give an indication into the degree of modification of the aquatic environment. The electro-narcosis technique was applied to sample the available fish species within the Olifants River system associated with the Proposed Project.

Six indigenous fish species were expected to occur within the study area. The fish species collected during the present study are presented in Table 11-23 and discussed in the below sub-sections. It should be noted that the low and standing water within the Olifants River and the associated tributaries hindered the sampling of fish.

Table 11-23: Fish Collected (or Observed) within the Project Area

Fish Species	Tributary of the Olifants		Olifants River		
	ETO1	**ETO2**	**O1**	**O2**	**O3**
Labeobarbus polylepis	-	DRY	-	-	-

Fish Species	Tributary of the Olifants		Olifants River		
	ETO1	ETO2	O1	O2	O3
Enteromius anoplus	153		-	-	-
Enteromius paludinosus	-		-	-	-
Clarias gariepinus	-		-	-	-
Pseudocrenilabrus philander	-		3	-	-
Tilapia sparrmanii	-		11	-	-
*Gambusia affinis**			18	-	-
Number of Species	**1**		**3**	-	-
Total Catch	**153**		**32**	-	-
* Alien species					

A total of four fish species were collected (or observed), of which one was regarded as alien invasive species (*Gambussia affinis,* or Mosquitofish). A single species (*Enteromius anoplus,* Chubbyhead Barb) was sampled at Site ETO1, whilst three were sampled at Site O1. All the species collected (or observed) at the Olifants River Site O1 have a high preference/tolerance for slow-shallow water, modified water quality, as well as no-flow conditions. The Chubbyhead Barb (only collected at Site ETO1), has a high preference for slow-shallow water and a moderate tolerance for no-flow conditions and water quality modifications (DWS, 2014).

The alien Mosquitofish was introduced in South Africa as a mosquito control agent and forage for bass, but has proved to be an aggressive invader species capable of restricting other fish populations by preying on fish larvae (Skelton, 2001). Its occurrence and dominance at Site O1 can be attributed to its habitat requirements, which were suited at the time of the survey (i.e. standing or slow-flowing water with plant cover).

11.6.4.1 Ecological Condition of the Fish Assemblages

The REMP uses the FRAI, which is based on the preferences of various fish species, as well as the frequency of occurrence. FRAI results for the sampled river reaches are shown in Table 11-24 and discussed below.

Table 11-24: FRAI Results for the Assessed Olifants River systems

Sampling Site	FRAI Score (%)	Ecological Category	Description
Eastern Tributary of the Olifants			
ETO1	43.7	**D**	Largely Modified
ETO2	DRY		
Olifants River			
O1	38.6	**D/E**	Largely to Seriously Modified
O2	20.0	**E/F**	Seriously to Critically Modified
O3	20.0	**E/F**	Seriously to Critically Modified

Despite collecting (or observing) more fish species at the Olifants River upper reaches, the sampled fish assemblage at the Eastern Tributary of the Olifants upper reaches was representative of *Largely Modified* (Ecological Category D) whilst that of the upper reaches of the Olifants River was representative of *Largely to Seriously Modified* (Ecological Category D/E). This finding was likely attributed to several factors including the dominance of the alien Mosquito fish at the upper of the Olifants.

At the middle and lower reaches of the Olifants River, none of the expected fish species were collected. Consequently, each of the reaches were representative of *Seriously* to *Critically Modified* states (Ecological Category E/F). These findings may be attributed to the following:

- The timing of the survey;
- Substrate and/or habitat heavily smothered with algae;
- Migratory behaviour of some species; and
- Inefficiency of the sampling technique.

The survey was undertaken in late dry season (i.e. September 2019) and this may have influenced the fish assemblages by reducing the population size (Tejerina-Garro & de Mérona, 2010). Also, all the sampled sites had no flow and lacked connectivity. Three of the expected species are known to migrate locally (i.e. 8 to >10 km) and a single species migrates long distances (DWS, 2014).

11.6.5 Integrated EcoStatus Determination

The EcoStatus is defined as: "*The totality of the features and characteristics of the river and its riparian areas that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services*" (Iversen *et al*., 2000). In essence, the EcoStatus represents an integrated ecological state representing the drivers (hydrology, geomorphology, physico-chemical) and responses (fish, aquatic invertebrates and riparian vegetation; Kleynhans & Louw, 2008).

The Instream Biological Integrity, as well as the integrated EcoStatus, for the sampled river reaches within the project area were determined below Table 11-25.

Table 11-25: The PES of the Reaches Sampled in September 2019 through the use of the ECOSTATUS4 (Version 1.02; Kleynhans & Louw, 2008)

Site	Response Indices				EcoStatus	
	MIRAI EC	FRAI EC	Instream EC*	Riparian Vegetation EC (IHI)	Score	Category
ETO1	52.9	43.7	49.1	61.2	56.0	D
ETO2	DRY					
O1	54.1	38.6	42.5	65.2	56.4	D
O2	41.4	20.0	34.1	65.2	48.5	D
O3	35.4	20.0	30.2	65.2	46.4	D
*confidence rated data						

Following integration of the defined ecological conditions obtained for the instream biological integrity (i.e. MIRAI from aquatic invertebrates) and the riparian component (i.e. IHI from riparian vegetation assessment), it was determined that the sampled river reaches along the Eastern Tributary of the Olifants and the Olifants River represented an integrated EcoStatus of *Largely Modified* (Ecological Category D). Despite all sites falling within the same Ecological Category of *Largely Modified*, the EcoStatus score for Site ETO1 was the highest, this was mainly due to the relatively high Instream EC score, which was greatly influenced by the FRAI score. Along the Olifants River, the EcoStatus' appeared to deteriorate along the longitudinal profile of the river system. This suggests that an accumulation of existing impacts, mainly stemming from mining (particularly the 2 Seam Coal Operation) and to some extent agricultural activities, occurs in the downstream direction, as seen with the recorded conductivity levels (see Appendix G). This in also indicated by the deteriorating MIRAI scores (I.e. Macroinvertebrate assemblages).

In relation to the Recommended Ecological Category (REC), the assessed sections of the Eastern Tributary of the Olifants and Olifants River were observed to attain to the stipulated Ecological Category of a **"**D**"**, as gazetted in April 2016 (*Proposed Classes and Resource Quality Objectives of Water Resources of the Olifants Catchment in Terms of Section 13(1)(a) and (b) of the National Water Act, 1998 (Act No.36 of 1998)*, 2016).

11.7 Hydropedology

The Hydropedological Impact Assessment was conducted during the EIA Phase and appended hereto as Appendix H. A site visit was undertaken on 5 February 2020 to understand and verify hillslope hydrology which determines the dominant water flow paths within the demarcated landscape units. Soil characteristics which indicate water residence times and leaching effects were assessed during the site visit. Physical and chemical soil characteristics which indicate water residence times were noted during the site visit. Any signs which indicate groundwater-surface water interaction were identified such as hillslope seeps, springs and wetlands.

11.7.1 Land Type and Hydrological Soil Types

The dominant land type within the project boundary is land type Bb4. Portions of the study area are also occupied by land types Bb5 and Fa8 (See Figure 11-19). The terrain of the land types that are found within the study area are presented in Figure 11-20.

The expected soil forms within land type Bb4 include the Avalon, Hutton, Glencoe, Mispah, Longlands, Rensburg, Estcourt, Katspruit, Valsrivier, Arcadia, Sterkspruit and Kroonstad.

Within land type Bb5, expected soil forms include Mispah, Glenrosa, Hutton, Rensburg, Glencoe, Wasbank, Avalon, Valsrivier, Clovelly, Swartland, Katspruit, Estcourt, Longlands and Kroonstad.

Finally, the expected soil forms within land type Fa8 include Mispah, Clovelly, Hutton, Wasbank and Estcourt. Additionally, bare rocks and stream beds are expected within this land type.

Based on the diagnostic horizons and materials associated with the expected soil forms, the probable hydrological soil types can be summarized as follows:

- Recharge – Hutton, Clovelly;
- Interflow (A/B) – Estcourt, Longlands, Valsrivier, Sterkspruit, Glenrosa;
- Interflow (Soil/Bedrock) - Glencoe, Wasbank, Swartland;
- Responsive (Shallow) – Mispah, Arcadia; and
- Responsive (Saturated) – Avalon, Rensburg, Katspruit, Kroonstad.

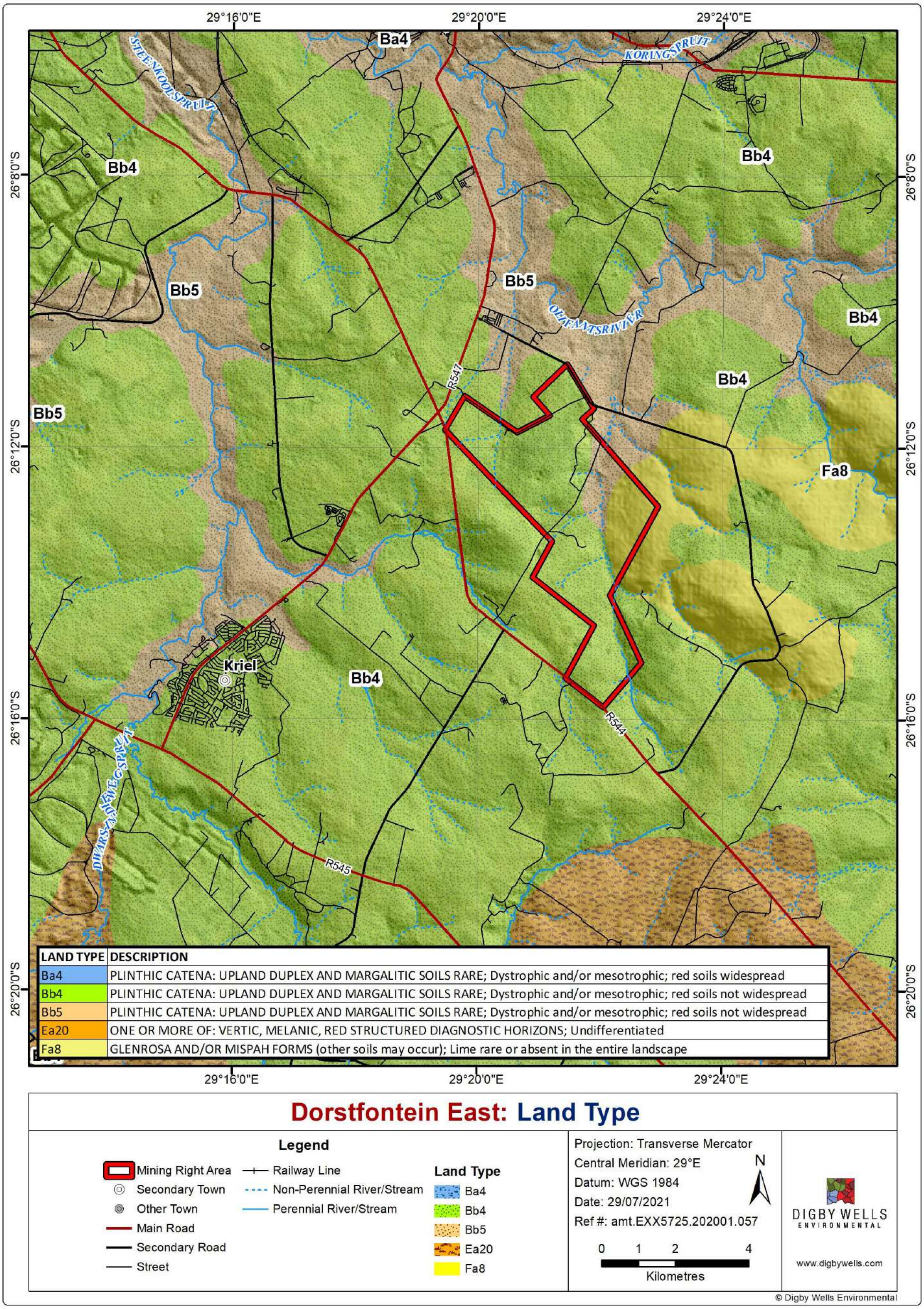


Figure 11-19: Land Types within the DECM

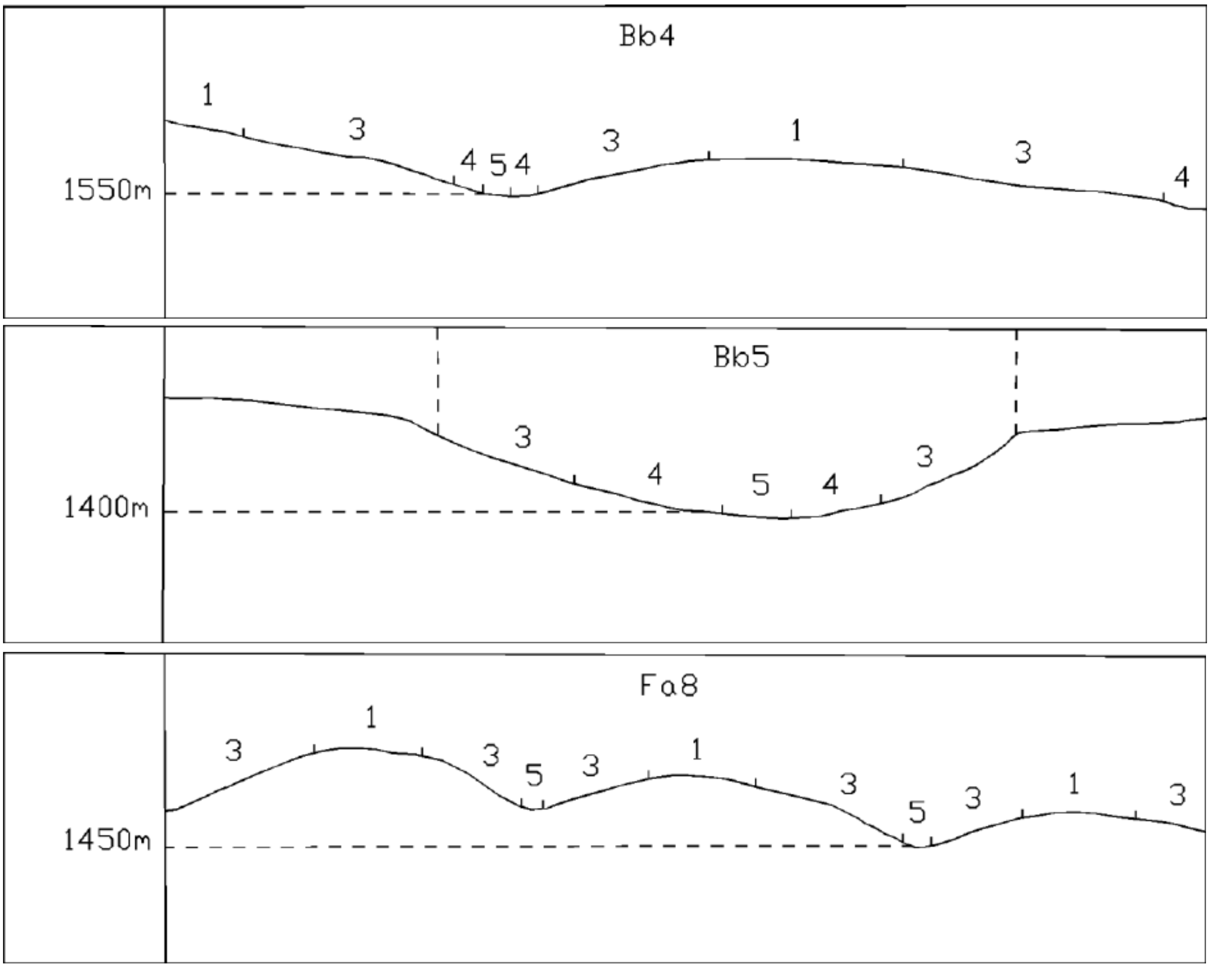


Figure 11-20: Terrain Morphological Units within the DECM Project Area

11.7.2 Land Use

The land uses associated with the DECM are indicated in Figure 11-21 below and include the following:

- Commercial annual crops rain-fed/ dryland;
- Fallow land & old fields (grass);
- Fallow land & old fields (bare);
- Natural grassland;
- Herbaceous wetlands (currently mapped);
- Herbaceous wetlands (previously mapped);
- Mines: extraction pits, quarries; and
- Mine: tailings and resource dumps.

- The dominant land uses include commercial annual crops rain-fed/ dryland, fallow land & old fields (grass); fallow land & old fields (bare) and natural grassland as indicated in the figure below.

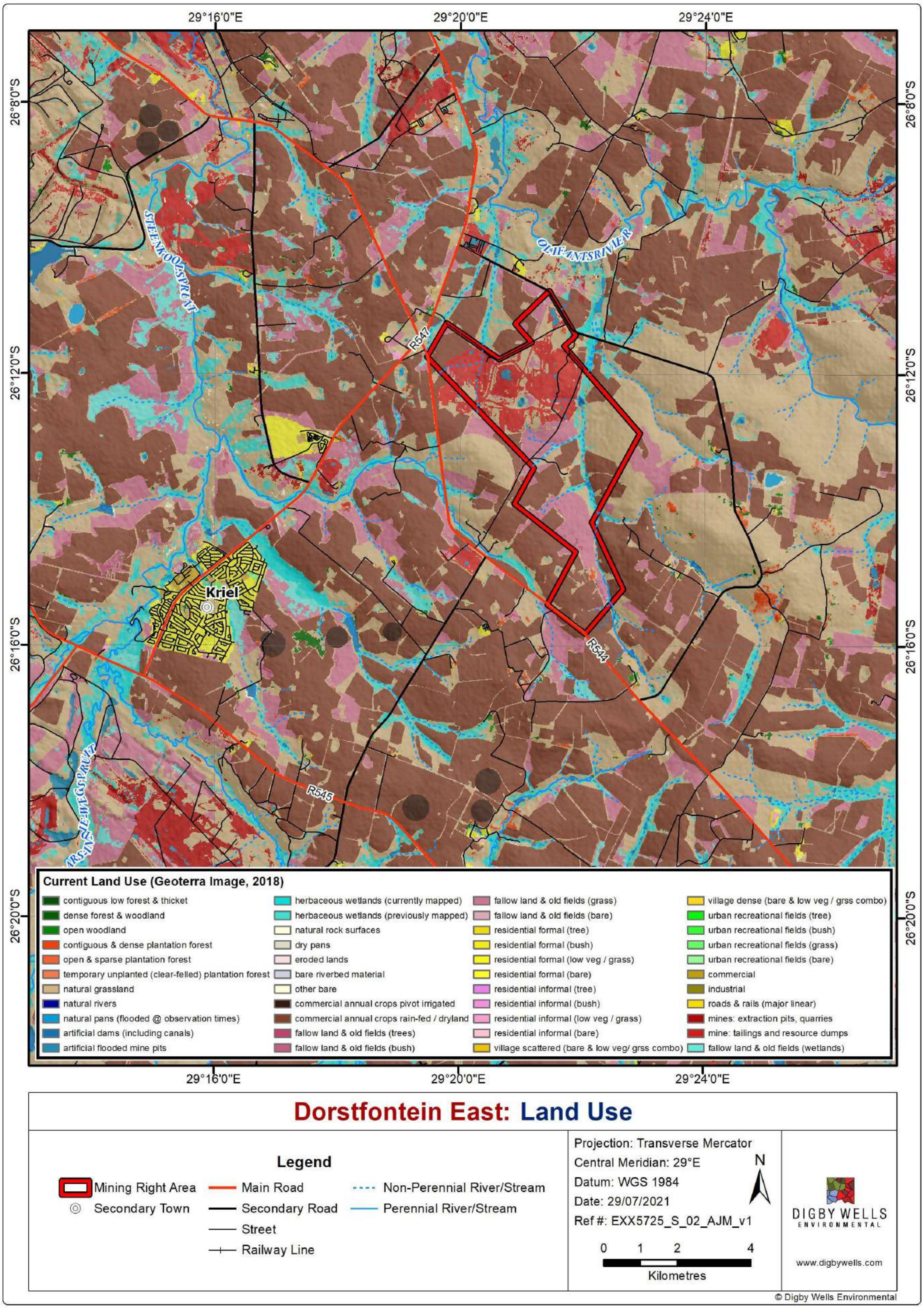


Figure 11-21: Land Uses within the DECM

11.8 Surface Water

The Surface Water Assessment undertaken during the EIA Phase is appended to this report as Appendix I.

11.8.1 Floodline Determination

11.8.1.1 Peak flows

Catchments were delineated for river systems draining the area and two of these are relevant to the DECM surface infrastructure development site (Figure 11-22). Peak flows for the sub-catchments are presented in Appendix I. Results from the RM3 method were used in hydraulic modelling since these were representative of the area due to site-specific runoff coefficients which were generated using an in-built RM3 module. The MIPI results helped in the selection of suitable peak flows because these were of the same order of magnitude to the RM3 method. The Standard Design Flood (SDF) results were deemed an over-estimate of peak flows for the site probably due to high regionalised runoff coefficients. Calculated peak flows are presented in Table 11-26.

Table 11-26: Calculated Peak Flows for Streams at the DECM Project Site

Catchment	RM3		SDF		MIPI	
	1:50yr	1:100yr	1:50yr	1:100yr	1:50yr	1:100yr
	(m^3/s)					
CB1	60.2	81.7	150.4	190.4	71.9	90.8
CB2	168.9	229.4	329.6	417.4	162.4	205.2

11.8.1.2 Floodlines

The modelled 1:50-year and 1:100-year indicate that none of the proposed infrastructure falls within the floodwater way. The proposed infrastructure will be constructed within already disturbed areas and will, therefore, be outside the 1:50-year and 1:100-year floodlines, refer to Figure 11-23.

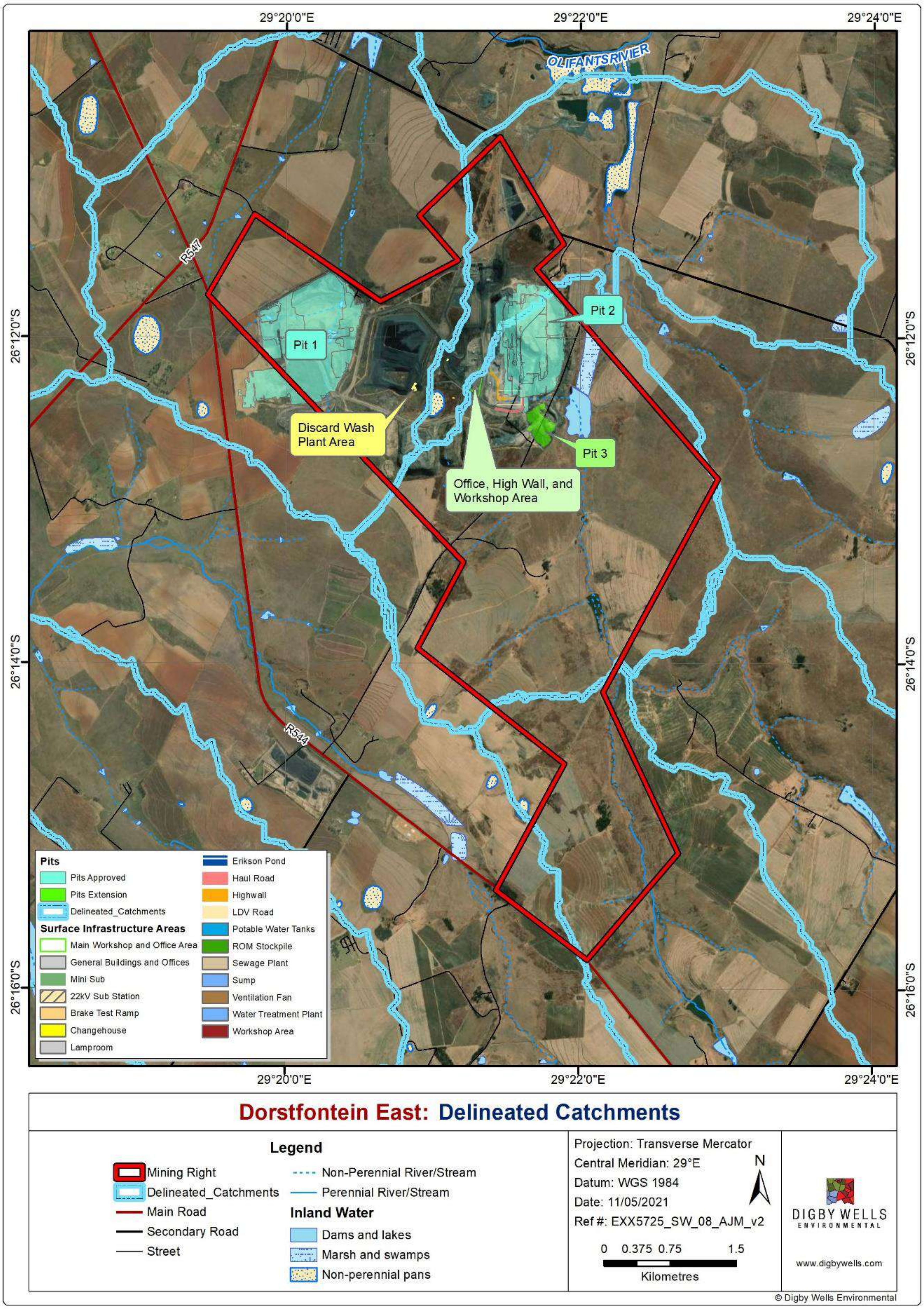


Figure 11-22: Delineated sub-catchments at the DECM Project Site

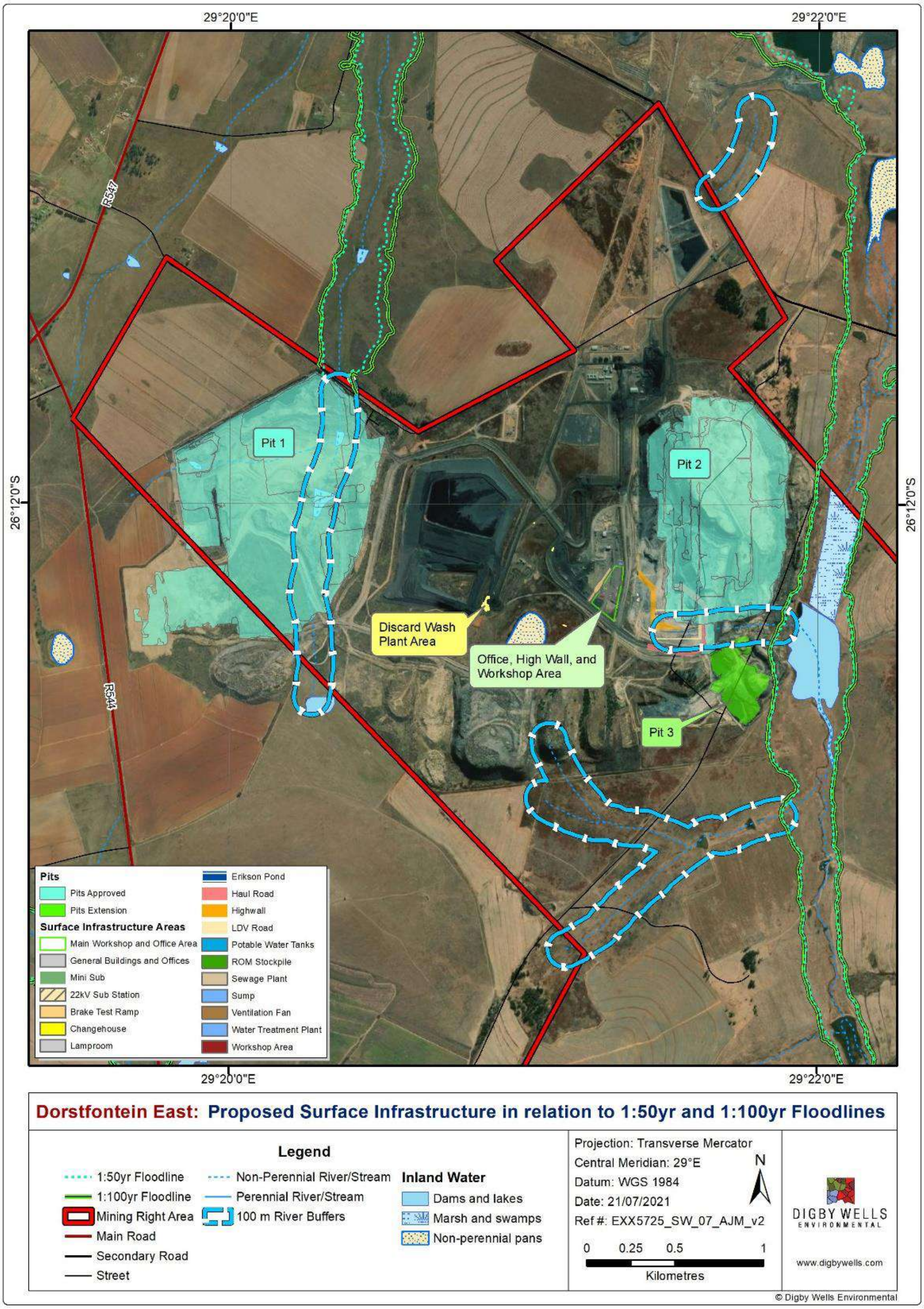


Figure 11-23: 1:50-year and 1:100-year floodlines for Rivers at the DECM Project Site

11.8.2 Water Quality

The historical water quality data for Dorstfontein East was sourced from existing Aquatico Water Quality Assessment Reports for the site (Aquatico, 2019). The limits stipulated by the WUL (Licence No.: 04/B11B/ACGIJ/957) for Water Resource Protection were used to benchmark water quality for DECM. In addition, the South African Water Quality Guidelines: Aquatic Ecosystems (DWAF, 1996) was also included for comparison purposes as the DWA's mandate also requires it to protect the health and integrity of aquatic ecosystems.

11.8.2.1 *Existing Water Quality Monitoring Points at DECM*

Existing surface water monitoring localities and their descriptions at the DECM are presented in Table 11-27.

Table 11-27: Existing Surface Water Monitoring Localities at DECM

Locality	Description	Coordinates	
	DCM East Surface Water		
DCM06	Upstream of Western tributary	S26.2183	E29.3676
DCM07	Downstream of Western tributary	S26.1907	E29.3688
DCM08	Pond downstream of Pit 1	S26.1939	E29.3395
ED01	Erichsen Dam 1	S26.1925	E29.3541
ED02	Erichsen Dam 2	S26.1925	E29.3543
ED03	Erichsen Dam 3	S26.1926	E29.3546
MP01	Downstream on western tributary of the Olifants River	S26.1714	E29.34
MP02	Downstream on western tributary of the Olifants River	S26.1728	E29.343
MP03	Bridge upstream of the old Transvaal Navigation Colliery	S26.1365	E29.345
MP04	Confluence of MP01 and MP02 tributaries with the Olifants River	S26.1555	E29.3436
MP05	Downstream of Transvaal Navigation Colliery	S26.1694	E29.3568
MP06	Upstream of mining activities on the Olifants River	S26.1681	E29.3746
Pan	Pan	S26.2054	E29.3504
PCD01	Pollution control dam 1	S26.1855	E29.3593
PCD02	Pollution control dam 2	S26.1861	E29.36
PCD03	Pollution control dam 3	S26.1878	E29.3597
RWDF	Return water discard facility	S29.3430	E29.3430
	DCM East Sewage		
SOE	Sewage effluent (East)	S26.1932	E29.3565
	DCM East Potable Water		
Potable water East	Potable water	S26.1935	E29.354
AM1	Andru Mining 1	S26.2014	E29.3545
AM2	**Andru Mining 2**	S26.1924	E29.3549
KW1	**Kwena Workshop 1**	S26.1931	E29.3550
KW2	**Kwena Workshop 2**	S26.1931	E29.3550
SLK	**SGS Lab Kitchen**	S26.1935	E29.3545
OFK	**Office Kitchen**	S26.1932	E29.3542
ECBH	Emalayinini Community Borehole	S26.1820	E29.3257
	DCM East Pit Water		
MPW01	Mining Pit Water (Pit 1)	S26.2027	E29.3373
MPW03	Mining Pit Water (Pit 2)	S26.2091	E29.3614

11.8.2.2 Results from Existing Water Quality Monitoring

Sampling localities which include DCM07, MP02 and DCM06 were dry during the sampling period to June 2019, and therefore, these could not be sampled. Average quarterly results for the analyses performed on the sampled localities are presented in Table 11-28.

Based on the calculated average for the monitoring period to June 2019, the general physical quality of the surface water in the DECM area can be described as acidic (DCM08c & MP01), neutral and alkaline (Pan), non-saline to very saline (TDS 249 mg/l to 2378 mg/l with an overall average of 596.8 mg/l, classified as saline) and soft to very hard (total hardness of 62 mg/l to 423 mg/l with an overall average of 189 mg/l classified as moderately hard).

The average physico-chemical quality of the water from locality DCM06 could be described as neutral, non-saline and hard. The WUL Water Resource limits were exceeded by the quarterly average pH value, as well as the concentrations of sodium and chloride. The limits stipulated by the SAWQG for Aquatic Ecosystems were exceeded by the average fluoride, aluminium and chromium concentrations during this quarter. The water quality can therefore be classified as good (Class 1) for domestic use (WRC, 1998).

The physico-chemical quality of the water from locality DCM08c in May 2019 could be described as acidic, non-saline and moderately soft. The WUL Water Resource limits were exceeded by the quarterly average pH value. Both the WUL and the limits stipulated by the SAWQG for Aquatic Ecosystems were exceeded by the aluminium and manganese concentration, while the SAWQG for Aquatic Ecosystems were exceeded by the average chromium concentration during the quarterly period. The water quality can therefore be classified as marginal (Class 2) for domestic use (WRC, 1998).

At locality MP01, the water could be described as acidic, non-saline and moderately soft. The WUL Water Resource limits were exceeded by the quarterly average pH value while both the WUL limits and the limits stipulated by the SAWQG for Aquatic Ecosystems were exceeded the average concentrations of aluminium and manganese and the SAWQG for Aquatic Ecosystems was exceeded by the average chromium concentration. Accordingly, the quarterly average water quality may be classified as marginal (Class 2) for domestic use (WRC, 1998).

The average concentrations of sodium recorded for localities MP03, MP04, MP05 and MP06 exceeded the limits stipulated by the water use license. The WUL limits were further exceeded by the quarterly average chloride concentrations calculated for MP03, MP04 and MP05 Pan. The average water qualities of these localities are very similar with neutral, non-saline and moderately hard to hard (MP03) physico-chemical properties. The water quality of these localities may be classified as ideal (Class 0; MP04 & MP05), good (Class 1; MP03 & MPP06) for domestic use (WRC, 1998).

The average pH value and concentrations of pH levels, TDS, sodium and chloride calculated for the Pan locality exceeded the limits stipulated by the WUL, while a high average fluoride concentration and aluminium and chromium concentrations exceeded the Aquatic Ecosystems guideline.

Table 11-28: Average Quarterly Results for DECM Area-Samples Resource Localities (June 2019)

VARIABLE	UNITS	DCM East WUL Water Resource Limits	SAWQG TWQGR for Aquatic Ecosystems	MONITORING LOCALITIES							
				DCM06	DCM08c	MP01	MP03	MP04	MP05	MP06	Pan
pH @ 25°C	pH	6.5/8.4	-	8.44	5.3	5.5	8	8.2	8.13	7.87	9.4
Electrical conductivity (EC) @ 25°C	mS/m	-	-	64.9	37.1	35.8	62.2	53.3	52.5	50.9	319
Total hardness	mg CaCO3/l	-	-	211	65	62	225	182	175	175	423
Total Dissolved solids @ 180°C	mg/l	-	-	441	254	249	415	357	347	331	2378
Calcium (Ca)	mg/l	-	-	24	13	13	41.7	34.3	32.3	35	22.3
Magnesium (Mg)	mg/l	-	-	37	8	7.33	29.3	23.3	23	21.3	89.3
Sodium (Na)	mg/l	21.12	-	64.4	14	14	42	38	38	35.3	690
Potassium (K)	mg/l	-	-	9.54	26	26	7.07	6.7	6.63	6.13	4.57
Total alkalinity	mg CaCO3/l	-	-	288	2.5	2.5	180	155	152	169	1400
Chloride (Cl)	mg/l	25	-	39.7	24	24.7	26	25.7	25.7	21	277
Sulphate (SO_4)	mg/l	400	-	25.5	119	105	115	87	84	71	152
Nitrate (NO_3) as N	mg/l	-	-	0.066	0.05	0.067	0.05	0.05	0.05	0.133	0.05
Ammonium (NH_4) as N	mg/l	-	-	0.274	4.5	4.23	0.133	0.083	0.083	0.117	0.233
Orthophosphate (PO_4) as P	mg/l	-	-	0.053	0.05	0.05	0.05	0.05	0.05	0.05	0.833
Fluoride (F)	mg/l	-	0.75	0.9	0.5	0.333	0.633	0.633	0.7	0.867	3.4
Aluminium (Al)	mg/l	0.18	0.005	0.034	0.2	0.508	0.05	0.05	0.05	0.05	0.154
Iron (Fe)	mg/l	-	-	0.038	0.066	0.717	0.013	0.034	0.039	0.062	0.216
Manganese (Mn)	mg/l	0.18	0.18	0.039	1.34	1.31	0.018	0.013	0.042	0.013	0.03
Chromium (Cr)	mg/l	-	0.007	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Sodium Adsorption Ratio	SAR	-	-	1.94	0.8	0.8	1.2	1.2	1.23	1.17	14.67
Bicarbonate alkalinity	mg CaCO3/l	-	-	269	5	2.5	180	155	163	181	929
Carbonate alkalinity	mg CaCO3/l	-	-	20.1	-	2.5	2.5	2.5	2.5	2.5	472
Langelier Saturation Index	LSI	-	-	0.59	-4.6	-4.37	0.33	0.33	0.27	0.15	2.23
Calcium hardness	mg CaCO3/l	-	-	60	33	32	104	86	81	87	56
Magnesium hardness	mg CaCO3/l	-	-	152	32	30	121	96	94	88	367

A general overview of constituent parameters that add up to the overall TDS concentration of the Pan monitoring locality is presented in Figure 11-24. Based on these results, the high salinity of the Pan is primarily dominated by sodium and alkalinity. The water quality of the Pan may be classified as poor (Class 3) for domestic use (WRC, 1998).

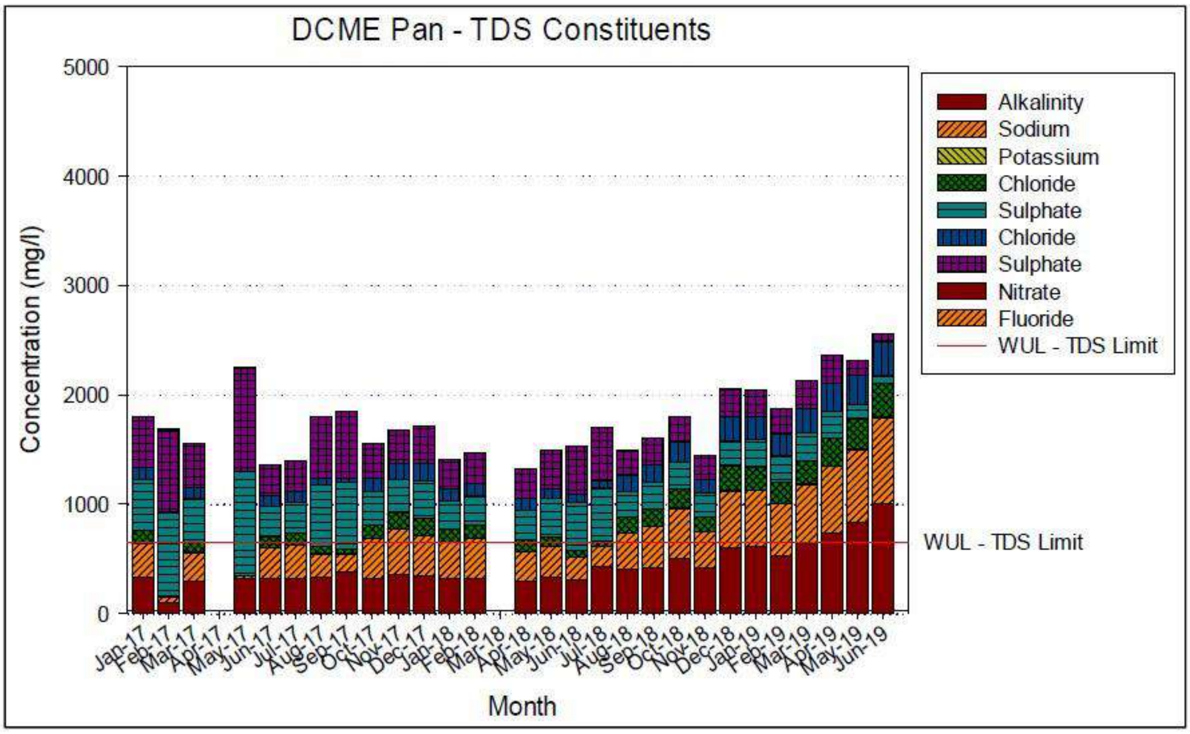


Figure 11-24: Concentration of TDS and its Constituents for the DECM Area Pan (January 2017-June 2019)

11.8.2.3 Water Quality Upstream and Downstream of the Olifants River

Table 11-29 compares the average qualities recorded for localities MP03 (locality upstream of the old Transvaal Navigation Colliery) and MP05 (downstream of the old Transvaal Navigation Colliery). There were slight increases on some of the variables in a downstream direction, but on the concentration of many variables there was an improvement or no change at all.

Table 11-29:Water Quality Upstream and Downstream of the Olifants River from April to June 2019

VARIABLE	UNIT	DCM East WUL Water Resource Limits	Locality		CALCULATED CHANGE
			Upstream	Downstream	
			MP03	MP05	
pH @ 25°C	pH	6.5/8.4	8	8.13	0.13
Electrical conductivity (EC) @ 25°C	mS/m	-	62.2	52.5	-9.7
Total Dissolved solids @ 180°C	mg/l	650.0 mg/l	415	347	-68
Total hardness	mg CaCO3/l	-	225	175	-50
Calcium (Ca)	mg/l	-	41.7	32.3	-9.4
Magnesium (Mg)	mg/l	-	29.3	23	-6.3
Sodium (Na)	mg/l	21.12 mg/l	42	38	-4
Potassium (K)	mg/l	-	7.07	6.63	-0.44
Total alkalinity	mg CaCO3/l	-	180	152	-28
Chloride (Cl)	mg/l	25.0 mg/l	26	25.7	-0.3
Sulphate (SO_4)	mg/l	400.0 mg/l	115	84	-31
Nitrate (NO_3) as N	mg/l	-	*0.05*	*0.05*	0
Ammonium (NH_4) as N	mg/l	-	0.133	*0.083*	-0.05
Orthophosphate (PO_4) as P	mg/l	-	*0.05*	*0.05*	0
Fluoride (F)	mg/l	-	0.633	0.7	0.067
Aluminium (Al)	mg/l	0.18 mg/l	*0.05*	*0.05*	0
Iron (Fe)	mg/l	-	*0.013*	0.039	0.026
Manganese (Mn)	mg/l	0.18 mg/l	*0.018*	*0.042*	0.024
Chromium (Cr)	mg/l	-	*0.013*	*0.013*	0
Sodium Adsorption Ratio	SAR	-	1.2	1.23	0.03
Bicarbonate alkalinity	mg CaCO3/l	-	180	163	-17
Carbonate alkalinity	mg CaCO3/l	-	*2.5*	*2.5*	0
Langelier Saturation Index	LSI	-	0.33	0.27	-0.06
Calcium hardness	mg CaCO3/l	-	104	81	-23
Magnesium hardness	mg CaCO3/l	-	121	94	-27

When comparing MP06 to locality MP03 (the furthest upstream and furthest downstream localities monitored), slight increases in the average concentrations of some of the variables are observed (Table 11-30). This is not unexpected as the concentrations of dissolved substances do generally increase as they are carried downstream by the flow of the river.

Table 11-30: Spatial Assessment Indicating Potential Impacts on the Aquatic Environment of the Olifants River during April to June 2019.

VARIABLE	UNIT	DCM East WUL Water Resource Limits	Locality		CALCULATED CHANGE
			Upstream	Downstream	
			MP06	MP03	
pH @ 25°C	pH	6.5/8.4	7.87	8	0.13
Electrical conductivity (EC) @ 25°C	mS/m	-	50.9	62.2	11.3
Total Dissolved solids @ 180°C	mg/l	650.0 mg/l	331	415	84
Total hardness	mg CaCO3/l	-	175	225	50
Calcium (Ca)	mg/l	-	35	41.7	6.7
Magnesium (Mg)	mg/l	-	21.3	29.3	8
Sodium (Na)	mg/l	21.12 mg/l	35.3	42	6.7
Potassium (K)	mg/l	-	6.13	7.07	0.94
Total alkalinity	mg CaCO3/l	-	169	180	11
Chloride (Cl)	mg/l	25.0 mg/l	21	26	5
Sulphate (SO_4)	mg/l	400.0 mg/l	71	115	44
Nitrate (NO_3) as N	mg/l	-	*0.133*	*0.05*	-0.083
Ammonium (NH_4) as N	mg/l	-	*0.117*	0.133	0.016
Orthophosphate (PO_4) as P	mg/l	-	*0.05*	*0.05*	0
Fluoride (F)	mg/l	-	0.867	0.633	-0.234
Aluminium (Al)	mg/l	0.18 mg/l	*0.05*	*0.05*	0
Iron (Fe)	mg/l	-	0.062	*0.013*	-0.049
Manganese (Mn)	mg/l	0.18 mg/l	*0.013*	*0.018*	0.005
Chromium (Cr)	mg/l	-	*0.013*	*0.013*	0
Sodium Adsorption Ratio	SAR	-	1.17	1.2	0.03
Bicarbonate alkalinity	mg CaCO3/l	-	181	180	-1
Carbonate alkalinity	mg CaCO3/l	-	*2.5*	*2.5*	0
Langelier Saturation Index	LSI	-	0.15	0.33	0.18
Calcium hardness	mg CaCO3/l	-	87	104	17
Magnesium hardness	mg CaCO3/l	-	88	121	33

11.9 Groundwater

The Groundwater Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix J.

11.9.1 Regional Geology

DECM is located within the Witbank coalfield, which is within the Karoo Supergroup. The Karoo Supergroup within the project area comprises the Ecca Group as well as the Vryheid Formation. The base of the Karoo Supergroup is the Dwyka Group comprising of tillites that are fairly regularly deposited over the basin except for paleo-topographical highs. The Dwyka tillites are overlain by the Vryheid Formation of the Ecca Group which hosts the coal seams.

The Vryheid Formation consists of various sequences of stacked upward-coarsening depositional sequences of sandstone and siltstone with the various coal seams located within the alternating lithofacies. The sediments (the coal-bearing sandstones and siltstones) rest either conformably on diamictites and associated glaciogenic sediments of probable Dwyka age, or unconformably on basement rocks (GCS, 2019). The Ecca Group sediments overlie the Dwyka Group. The geology can be stratigraphically classified as indicated in Table 11-31.

Table 11-31: Stratigraphy of the Regional Geology

	Subgroup	Lithology	Formation
Karoo Supergroup	Upper Ecca	Sandstones	Volksrust
	Middle Ecca	Sandstones	Vryheid
		Shales	
		Coal	
	Lower Ecca	Shale	Pietermaritzburg

11.9.2 Hydrogeology

A summary of water strike depths within DECM monitoring boreholes is given in Table 11-32. For the weathered zone, water strikes were encountered between 2-25 mbgl corresponding to the weathered aquifer. While for the fractured rock units intersected in the boreholes water strikes were observed frequently for depths between 25-57 mbgl corresponding to the fractured Karoo (Ecca) aquifer. None of the boreholes was drilled into the deeper lying fractured pre- Karoo aquifer.

Table 11-32: Water Strike Frequency within DECM (Source: GCS, 2016)

Borehole ID	Drilled borehole depth (m)	Weathered aquifer water strike position (mbgl)	Fractured aquifer water strike position (mbgl)
DFTNM1	75	15	
DFTNM2	75	24	
DFTNM3	75	2	57
DFTNM4	75	None	56
DFTNM5	40	19	
DFTNM6	85	25	
DFTNM7	85	None	38 & 56
DFTNM8	85	25	None
DFTNM9	85	None	39
DFTNM10	40	17	
DFTNM12	85	None	43

Borehole ID	Drilled borehole depth (m)	Weathered aquifer water strike position (mbgl)	Fractured aquifer water strike position (mbgl)
DFTNM13	85	None	None

** mbgl – meters below ground level*

11.9.3 Hydrocensus Survey

A hydrocensus survey was conducted by Digby Wells on 12 and 13 August 2020. The aim of the survey was to obtain the most up-to-date data on current groundwater use in the area and cross-check water levels and other relevant data that was collected during a hydrocensus conducted by GCS between 25 and 27 August 2016.

The 2020 hydrocensus survey was conducted within an approximate 2 km survey radius of DECM. A total of 15 boreholes were visited. Groundwater levels were measured and in-field parameters were taken, where possible. Boreholes surveyed in 2020 and 2016 are shown in Table 11-33 and Figure 11-25. The hydrocensus survey results are presented below.

11.9.3.1 Borehole Status

The borehole status is described as follows:

- Six monitoring boreholes of which three boreholes are owned by Exxaro and the remaining borehole is owned by BHP Billiton. All four boreholes are part of the monitoring network at DECM;
- Eleven boreholes used for domestic and livestock watering purposes at nearby farm portions; and
- Two boreholes not in use at Portion 2, Boschkrans farm and one borehole also not in use at Jan Dieta farm portion.

11.9.3.2 Groundwater Use

The section below is a summary of findings from the Hydrogeological Investigation report (GCS, 2019):

- The main source of water supply in and around the proposed mining area is groundwater. Through several privately own boreholes and springs which are mainly used for domestic and livestock purposes. In some instances, boreholes are used for single and/ or several households for various uses such as domestic (farm workers) and livestock use. Some farmers had previously mentioned that the water is filtered or softened prior consumption due to the elevated salts; and
- Three privately owned springs can be found south-east of the current mining activities:
  - Farm Fentonia 54 IS (DFTNS1 & DFTNS2): Mr Edmund Muller has two fountains that have been excavated and lined with concrete. The overflow from these

fountains drains into larger dams, which serve as drinking water for livestock. The yields of these fountains are not known; and

- Farm Rietkuil 57 IS (DFTNS3): The fountain belongs to Mr Gerhard de Wet and is also lined with concrete. It is used as the source of potable water supply to the farmstead, and as such is still used by farmworkers. The overflow drains into an earth dam which is used for livestock drinking water.

Table 11-33: Hydrocensus Borehole Data – 2020 Update And Previously Collected Data (Source: GCS, 2016)

ID	Coordinates			Owner Information		Bore/Spring Status & Equipment					Hydrogeological Information		In-situ water quality (Aug-20)			
	Easting [m]	Northing [m]	Elevation [mamsl**]	Owner	Farm Name	Primary Water Application			Equipment	Estimated Abstraction Rate [L/s]	Static Water Level [mbRL]*		EC (mS/cm)	TDS (ppm)	pH	T (C)
						Primary Use	Other Uses									
							Domestic	Stock Watering			Aug-16	Aug-20				
NBH4	29.3405	-26.2387	1610	N. Hirschowitz	Portion RE. Dorstfontein 71 IS	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	0.5	8.7	8.2	0.53	0.26	6.76	16.8
NBH4B	29.3366	-26.2405	1592	N. Hirschowitz	Portion RE. Dorstfontein 71 IS	Unused	(previously domestic)	(previously livestock)	Submersible pump (removed)		-	0.7	-	-		-
NBH5	29.1783	-26.1783	1592	BHP Billiton	North of DECM	Monitoring BH	Not Applicable	Not Applicable	N/A	0	8.6	-	-	-		-
NBH5A	29.3566	-26.1703	1539	BHP Billiton	North of DEM	Monitoring BH	Not Applicable	Not Applicable	N/A	0	11.74	6.3	0.54	0.27	7.14	20.2
D10	29.4032	-26.2182	1635	CJ Lourens	Jan Dieta	Domestic	Yes (Small Scale)	Not Applicable	Submersible pump	0	8.48	-	-	-	-	-
D10A	29.4009	-26.2154	1636	CJ Lourens	Jan Dieta	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	1	7.8	Pumping	0.26	0.13	6.92	18.4
DFTNM3	29.3625	-26.2158	1563	Exxaro	Fentonia	Monitoring BH	Not Applicable	Not Applicable	N/A	N/A	20.1	21.0	0.42	0.21	6.69	18.1
DFTNM4	29.3576	-26.2164	1577	Exxaro	Fentonia	Monitoring BH	Not Applicable	Not Applicable	N/A	N/A	14.8	13.6	0.43	0.22	7.05	17.3
DFTNM12	29.3246	-26.1954	1588	Exxaro	Welstand	Monitoring BH	Not Applicable	Not Applicable	N/A	N/A	7.2	12.2	0.44	0.22	6.19	19.3
WSBH2	29.3239	-26.1831	1593	Mr. Swart	Welstand	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	1	21.9	-	-	-	-	-
WSBH1	29.3233	-26.1851	1589	Mr. Swart	Welstand	Domestic	Yes (Small Scale)	Not Applicable	Submersible pump	1	15.2	Pumping	0.48	0.24	6.64	13.9
WSWP1	29.3221	-26.1185	1550	Mr. Swart	Welstand	Domestic	Yes (Small Scale)	Yes (Small Scale)	Windmill	N/A	20.6	-	-	-	-	-
NBH23	29.3119	-26.1887	1609	IJG De Wet	Portion 2, Rietkuil	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	1	50.7	Pumping	0.48	0.24	6.27	19.6
NBH24	29.3116	-26.1913	1613	IJG De Wet	Portion 2, Rietkuil	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	1	13.2	Pumping	0.45	0.22	6.09	19.6

ID	Coordinates			Owner Information		Bore/Spring Status & Equipment					Hydrogeological Information			In-situ water quality (Aug-20)			
	Easting [m]	Northing [m]	Elevation [mamsl**]	Owner	Farm Name	Primary Water Application			Equipment	Estimated Abstraction Rate [L/s]	Static Water Level [mbRL]*			EC (mS/cm)	TDS (ppm)	pH	T (C)
						Primary Use	Other Uses										
							Domestic	Stock Watering			Aug-16	Aug-20					
BHU1	29.3231	-26.1840	1593	BHP Billiton	Welstand	Monitoring BH	Not Applicable	Not Applicable	N/A	0	46.9	15.9		-	-	-	-
D7	29.3906	-26.2465	1634	E. Muller	Portion 2, Boschkrans	Domestic	yes (Small Scale)	Not Applicable	Submersible pump	0	10.7	-		-	-	-	-
D7B	29.3903	-26.2474	1638	E. Muller	Portion 2, Boschkrans	Domestic	yes (Small Scale)	Not Applicable	Submersible pump		-	2.8		-	-	-	-
D7C	29.3929	-26.2499	1642	E. Muller	Portion 2, Boschkrans	Domestic	Yes (Small Scale)	Yes (Small Scale)	Submersible pump	1	-	Pumping		-	-	-	-
D12	29.3568	-26.1783	1558	Unknown	Vlaklaagte	Domestic	yes (Small Scale)	Yes (Small Scale)	Windmill	Unknown	3.1	-		-	-	-	-
D4	29.3813	-26.2768	1652	E. Muller	Portion 2, Boschkrans	Domestic	yes (Small Scale)	Not Applicable	Submersible pump	1l/s	12.2	8.8		0.87	0.41	6.23	19.5
D4A	29.3803	-26.2703	1632	E. Muller	Portion 2, Boschkrans	None	Not Applicable	Not Applicable	N/A	0	3.1	1.0		0.65	0.35	6.49	18.7

***mbRL = meters below reference level (i.e. top of casing or surface level)**

**** mams; = meters above mean sea level**

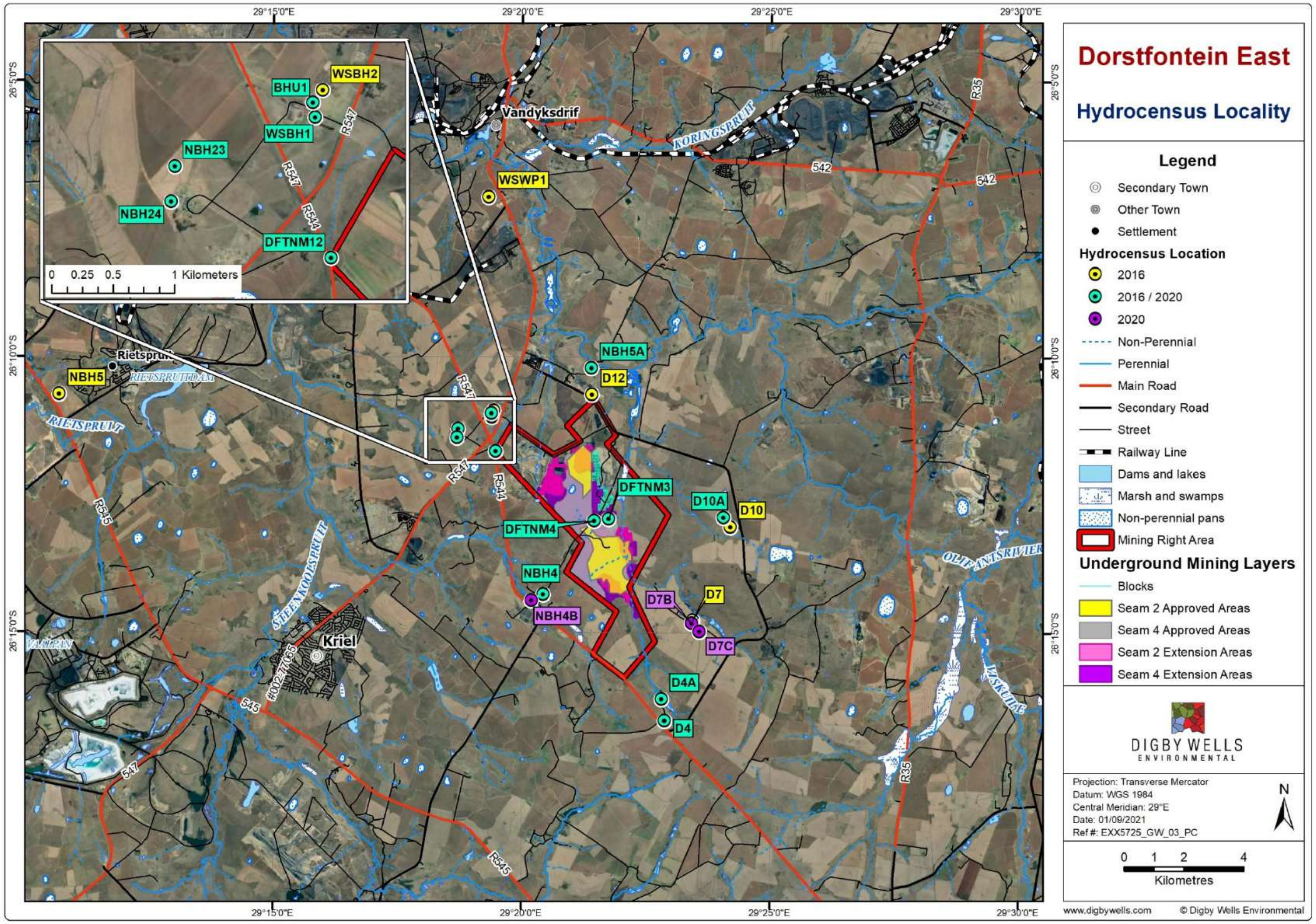


Figure 11-25: Hydrocensus Localities For The 2020 and 2016 Hydrocensus Surveys

11.9.4 Groundwater Levels

11.9.4.1 Historical Data

DECM has a groundwater monitoring network (Figure 11-29). Some boreholes that were part of the monitoring network have been destroyed over time while activities were expanding and at current, the network consists of 11 operational monitoring boreholes. Water level monitoring is conducted quarterly. For this study results collected during hydrocensus surveys in 2016 and 2020 were combined with monitoring data for the last 10 years (January 2010 and April 2020). The groundwater depth (meters below ground level) and elevation (meters above mean sea level) are given in Figure 11-26 to Figure 11-28.

As is evident from Figure 11-26, pre-mining groundwater levels where relatively shallow and were in general less than 20 mbgl in 2010 and the first half of 2011. At the end of 2011 groundwater levels in some of the boreholes started to decrease, and at the end of 2016 most monitoring boreholes showed a decrease in groundwater levels, between approximately 5 m (DTFNM9) up to 25 m (DFTNM10). However, borehole DFTNM5 showed stable shallow groundwater level varying between 3 mbgl and 6 mbgl.

Boreholes DFTNM3, DFTNM6, DFTNM7 and DFTNM10, all in close vicinity to the opencasts, were the most impacted by the dewatering activities and showed decreases in water levels between 10 and 25 m; DFTNM4, DFTNM8, DFTNM9, DFTNM12, were less impacted and showed decreases less than 10 m.

After 2016, groundwater levels seem to have stabilised and the decreasing trends shown in Figure 11-26 do not continue in Figure 11-27. This may indicate that at current, the extent of the current cone of drawdown is not significantly expanding.

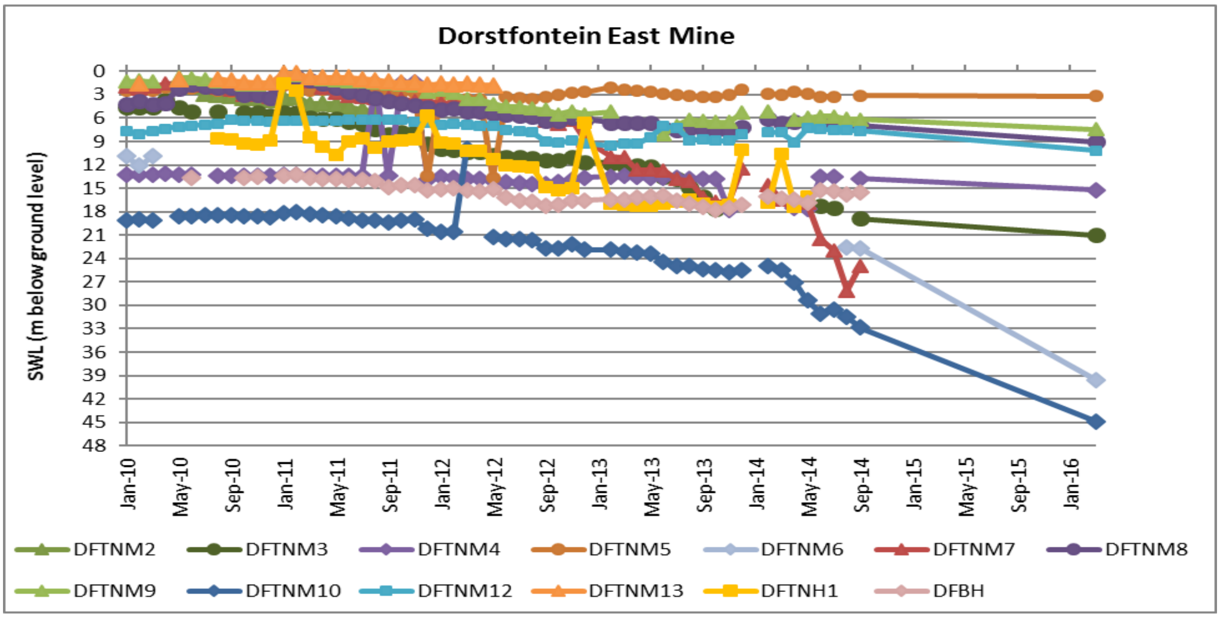


Figure 11-26: DECM Groundwater Levels in mbgl 2010-2015 (source: GCS 2019)

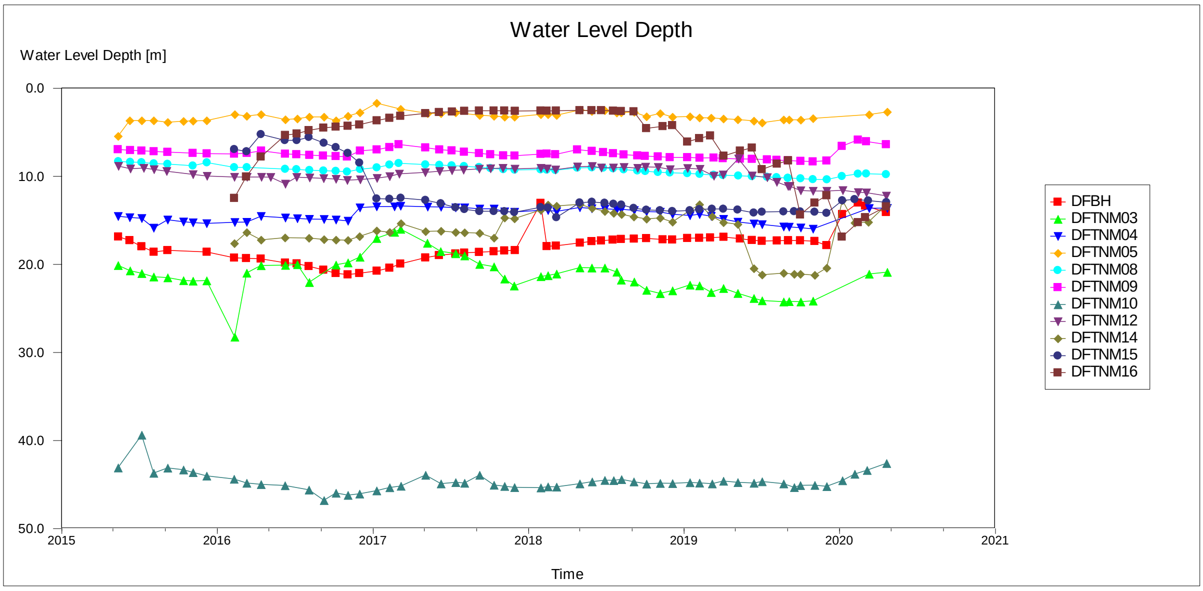


Figure 11-27: DECM Groundwater Levels in mbgl 2016-2020 (source: DECM)

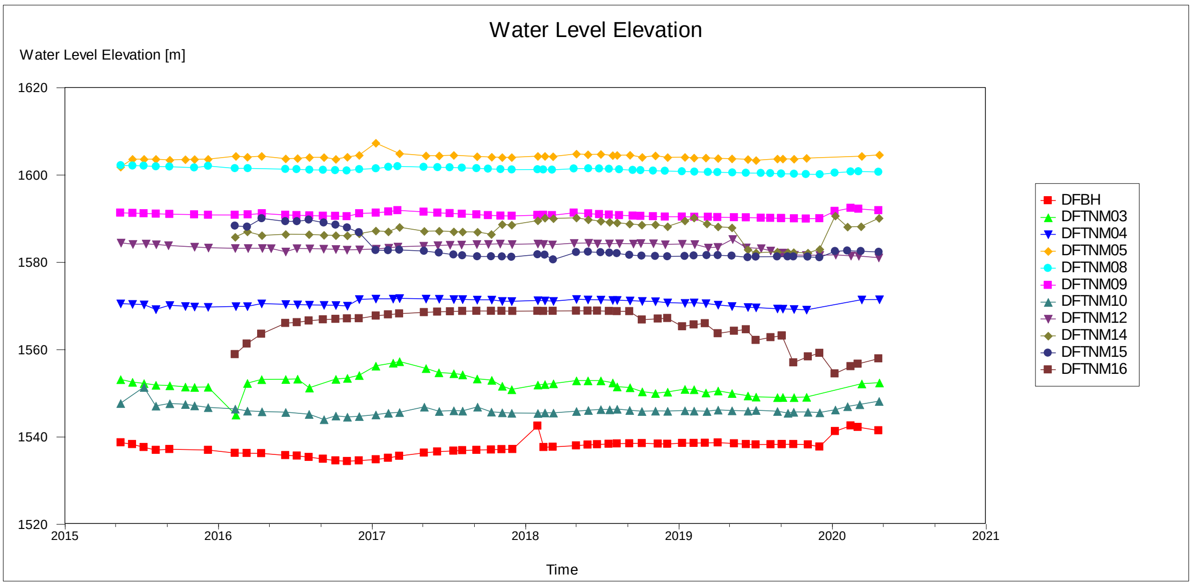


Figure 11-28: DECM Groundwater Levels in mamsl 2016-2020 (source: DECM)

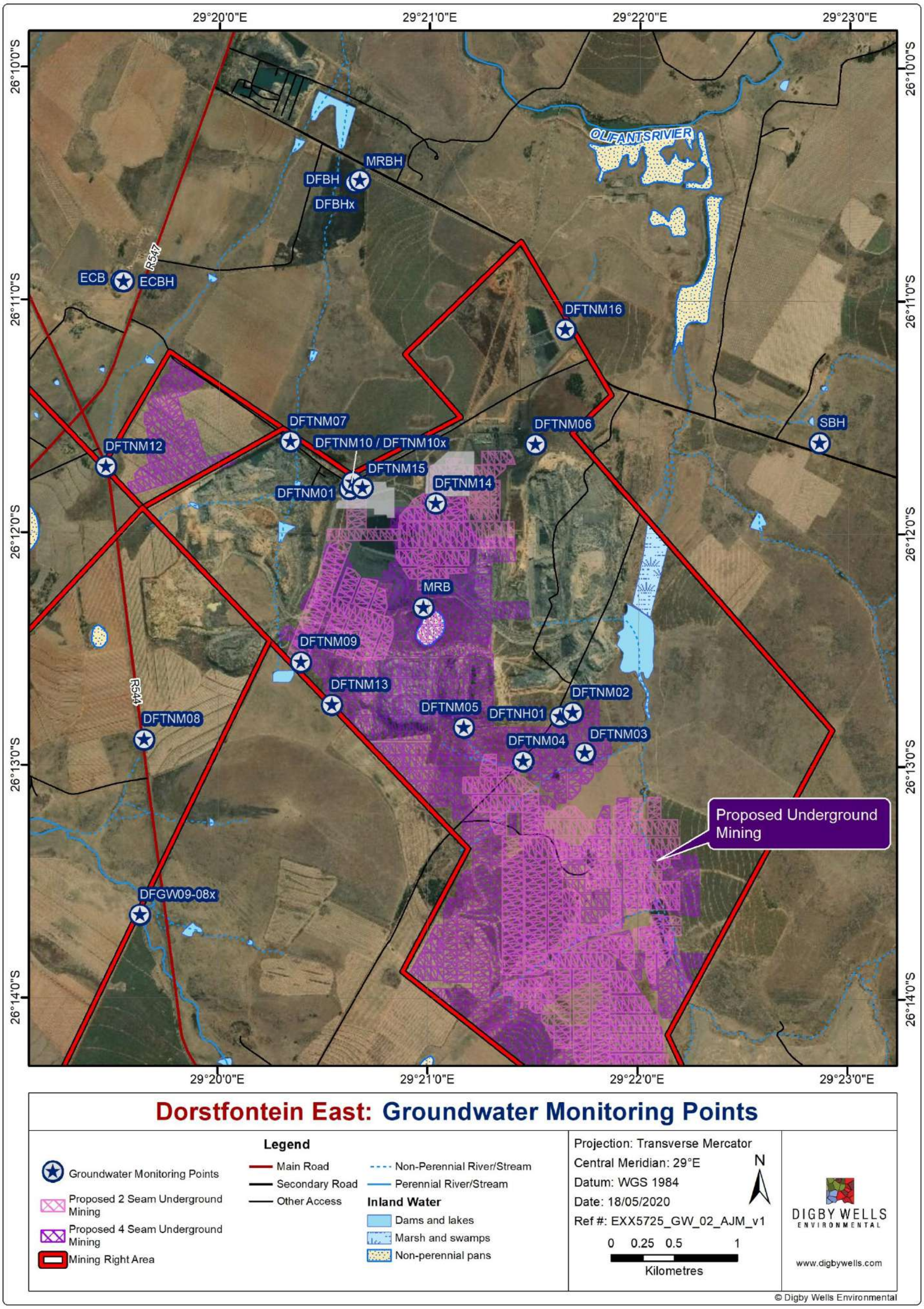


Figure 11-29: DECM Groundwater Monitoring Network

11.9.4.2 Current Groundwater Levels And Flow Directions

Recent water levels for the first quarter in 2020 (Table 11-34) were combined with the 2020 hydrocensus results (water levels of third party boreholes). Groundwater levels in monitoring boreholes ranged between 2.7 mbgl and 46 mbgl (DFTNM10) and between 1 541.5 mamsl (at DFBH) and 1 604.6 mamsl at (DFTNM05); and groundwater levels in hydrocensus boreholes ranged between 0.7 and 21 mbgl and between 1 533 and 1 643 mamsl.

The recent monitoring and hydrocensus data (Figure 11-30) shows a good correlation (97%) between groundwater levels and surface elevation thus suggesting groundwater levels within the Project area generally follow topographical gradients, with the exception of the areas in close vicinity to the current opencasts, as shown by DFTNM10 and DFTNM3. For the DECM area, this indicates that the groundwater flow direction is mainly in a northerly direction, however, as the site is situated on a topographical high, local flow directions along the eastern side of the site are east to northeast.

Table 11-34: Groundwater Levels- 2020 Monitoring

BH ID	Jan-20		Feb-20		Mar-20		Apr-20	
	SWL (mbgl)	WL Elevation (mamsl)	SWL (mbgl)	WL Elevation (mamsl)	SWL (mbgl)	WL Elevation (mamsl)	SWL (mbgl)	WL Elevation (mamsl)
DFBH	14.4	1541.3	13.1	1542.6	13.4	1542.2	14.1	1541.5
DFTNM03	-	-	-	-	21.1	1552.2	20.9	1552.4
DFTNM04	-	-	-	-	13.7	1571.4	13.7	1571.4
DFTNM05	-	-	-	-	3.0	1604.3	2.7	1604.6
DFTNM08	10.0	1600.5	9.8	1600.7	9.7	1600.8	9.8	1600.7
DFTNM09	6.6	1591.7	5.9	1592.4	6.1	1592.2	6.4	1591.9
DFTNM10	44.6	1546.2	43.8	1547.0	43.4	1547.4	42.6	1548.2
DFTNM12	11.6	1581.7	11.9	1581.5	11.9	1581.4	12.3	1581.1
DFTNM14	12.8	1590.6	15.3	1588.1	15.2	1588.2	13.3	1590.1
DFTNM15	12.8	1582.5	12.7	1582.6	12.8	1582.5	13.0	1582.3
DFTNM16	16.9	1554.5	15.3	1556.1	14.7	1556.7	13.5	1557.9
GCS02	4.5	1545.5	4.4	1545.6	4.5	1545.5	4.9	1545.1
GCS03	8.5	1552.0	8.5	1552.0	8.5	1552.0	8.6	1551.9
GCS04	-	-	-	-	1.5	1544.2	1.6	1544.1

*WL - Water Level
*SWL - Static Water Level
*mbgl - meters below ground level
*mamsl – meters above mean sea level

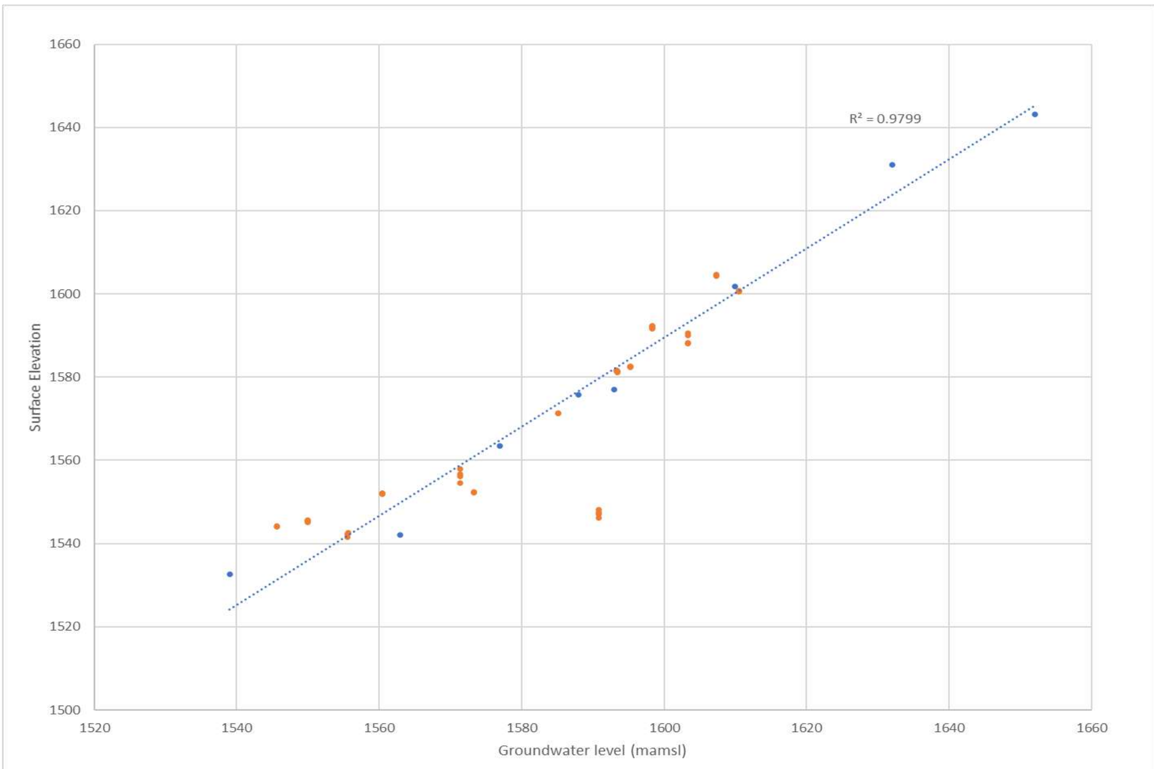


Figure 11-30: Bayesian Correlation For Groundwater Levels In Monitoring Boreholes (Orange) and Hydrocensus Boreholes (Blue)

11.10 Air Quality Assessment

The Air Quality Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix K.

11.10.1 Isopleth Plots and Evaluation of Results

11.10.1.1 Predicted GLC of $PM_{2.5}$

The predicted Ground Level Concentration (GLC) of $PM_{2.5}$ over a 24-hour averaging period for the operational phase returned simulation isopleths that are shown in Table 11-35 ($PM_{2.5}$ daily) and ($PM_{2.5}$ annual), see Appendix K.

The model simulations show the worst-case scenario (assuming no mitigation measures were put in place). The areas where exceedances of the 24-hour standard (40 µg/m³) are confined within the MR boundary. The predicted GLC at the sensitive receptors (DDES-6 (non-residential), DDES-12 (residential), DDES-13 (residential), and DDES14 (residential) will be lower than the daily standard, refer to Table 11-35 below. The annual GLC of $PM_{2.5}$ predicted will not exceed the regulatory standard at the selected receptors (Table 11-35).

11.10.1.2 Predicted GLC of PM_{10}

The predicted GLC of PM_{10} over a 24-hour averaging period returned simulation isopleths, PM_{10} daily and PM_{10} annual are shown in Appendix K.

The area where the 24-hour standard of 75 µg/m³ will be confined within the MR boundary. The predicted GLC at the nearest sensitive receptors DDES-6, DDES-12, DDES-13, and DDES14 were lower than the daily standard (Table 11-35). The predicted annual isopleth showed that areas, where exceedance will occur, are confined to within the MR boundary during operation.

11.10.1.3 Predicted Dustfall Rates

The predicted dustfall rates are shown in Appendix K (without mitigation and with mitigation). The predicted dustfall rates confirmed that the non-residential limit of 1 200 mg/m^2/d will be exceeded mostly within the MR boundary. With mitigation in place, the predicted dustfall rates at the selected receptors were lowered significantly (Table 11-35).

Table 11-35: Predicted Concentrations of PM_{10}, $PM_{2.5}$ and Dust Deposition Rates at Selected Sensitive Receptors

Pollutants	Averaging Period	South Africa Air Quality Standard (µg/m³)	Predicted Ground Level Concentration (µg/m³)			
			DDES-6	DDES-12	DDES-13	DDES-14
$PM_{2.5}$ (No Mitigation)	Daily	40(1)	7.8	1.7	4.4	5.7
	Annual	20(1)	0.8	0.2	0.4	0.5
PM_{10} (No Mitigation)	Daily	75(1)	47.8	8.4	21.5	29.5
	Annual	40(1)	4.5	0.9	2.1	2.6
Dust Deposition Rates (mg/m²/day)						
Dust (No Mitigation)	Monthly	Residential (600(2)) Non-residential (1200(2))	836	139	357	463
Dust (With Mitigation)			85	13	32	42

1. South African National Ambient Air Quality Standards, 2009;2012
2. South African National Dust Control Regulation, 2013 (NDCR)

11.11 Noise Assessment

The Noise Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix L.

11.11.1 Sensitive receivers

Due to the low population density of the receiving environment, sensitive receivers are limited and are at a distance from the proposed Project. The nearby sensitive receivers include:

- Farm homesteads, within 5km of the proposed noise generating infrastructure locations at the DECM; and
- Educational facility (Impilo Primary School), within 4 km of the proposed noise generating infrastructure locations at the DECM.

The Thubelihle town was identified to be too far (greater than 5km) away from the DECM to be significantly affected by the proposed Project.

11.11.2 Ambient Noise Levels

The results of the noise monitoring survey are presented in Table 11-36 and discussed in the sections below. The ambient noise levels recorded on-site, the rating limits according to the SANS 10103:2008 guidelines, are presented side by side. The Sound Pressure Level (SPL) are given in the A-weighted scale, which is used to filter the sound levels according to the human ear's varying response to different frequencies.

The time history graph per noise measurement location is displayed in Figure 11-31 to Figure 11-34. The graph shows the noise profile data as recorded in-field by the Cirrus SLM instrument and is presented in the A-weighted scale.

Table 11-36: Baseline Noise Measurements

Sample ID	SANS 10103:2008 rating limit					
	Type of district	**Period**	**Acceptable Rating Level dBA**	**$L_{Aeq,T}$ dBA (Field Measurement)**	**Maximum / Minimum dBA**	**Date**
N1	Rural	Daytime	45	53	88 / 22	07/06/2021– 08/06/2021
		Night-time	35	50	71 / 24	
N2	Rural	Daytime	45	52	83 / 11	09/06/2021 – 11/06/2021
		Night-time	35	50	71 / 26	
N3	Rural	Daytime	45	50	82 / 28	04/06/2021 – 05/06/2021
		Night-time	35	44	65 / 27	
N4	Rural	Daytime	45	47	83 / 27	02/06/2021 – 04/06/2021
		Night-time	35	47	90 / 31	
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night-time rating limit					

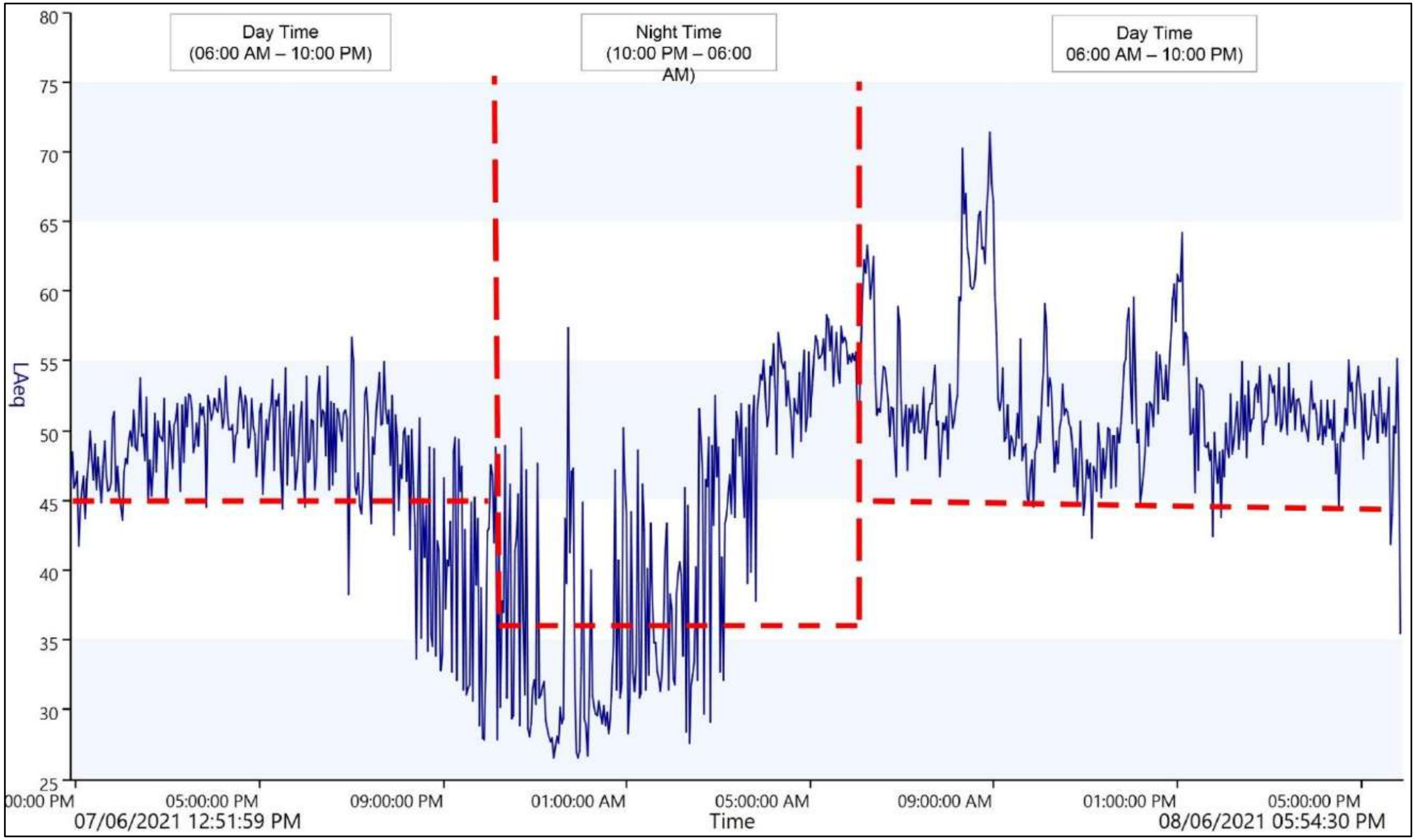


Figure 11-31: Noise Time Series Graph for N1

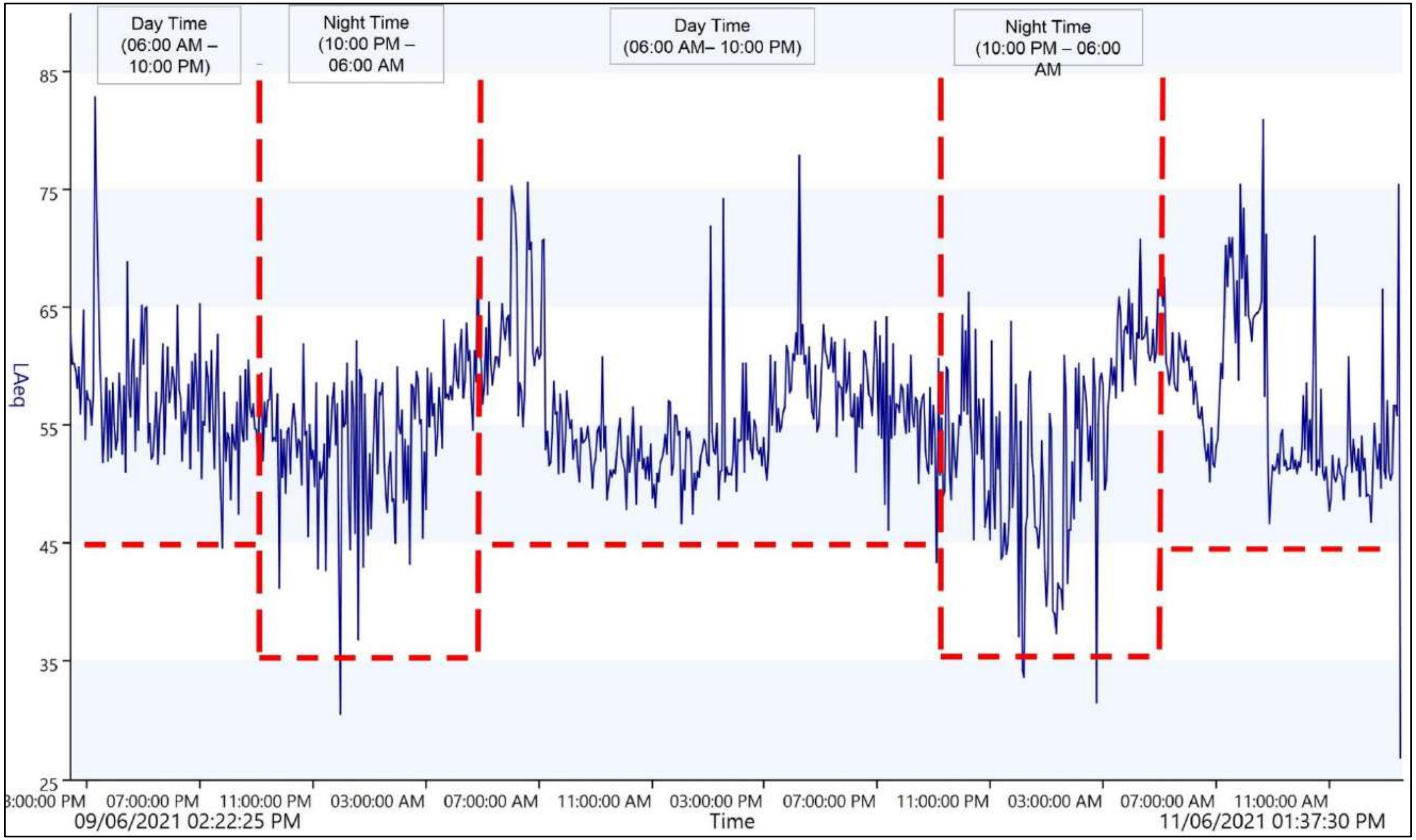


Figure 11-32: Noise Time Series Graph for N2

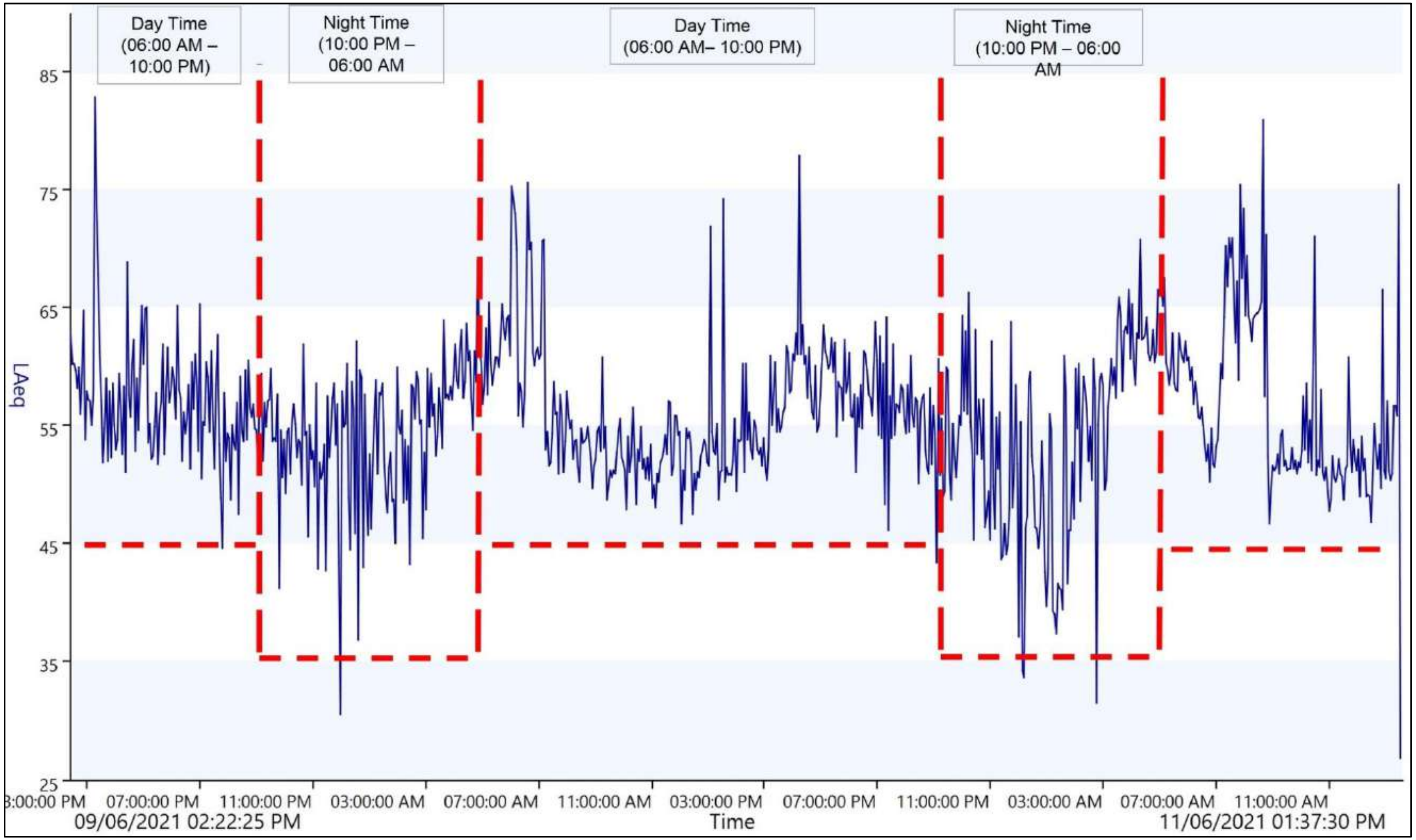


Figure 11-33: Noise Time Series Graph for N3

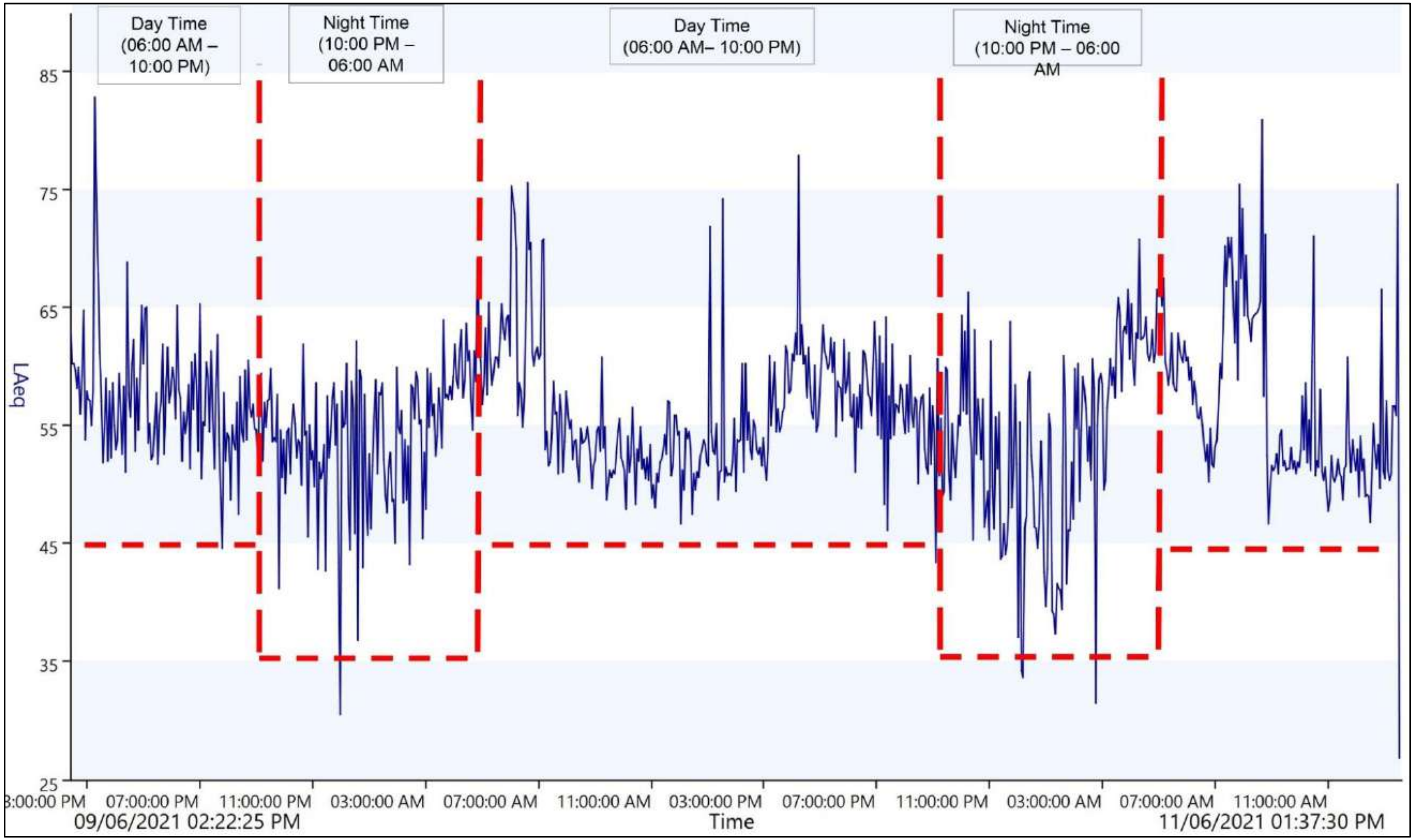


Figure 11-34: Noise Time Series Graph for N4

11.11.2.1 Day-Time Results

The LAeq for daytime ambient noise level measured throughout the measuring period for all monitoring locations was 49 dBA which is above the SANS guidelines maximum limit rating of 45 dBA allowable for outdoor daytime ambient noise in rural districts. The LAeq for daytime ambient noise level at all measurement locations N1, N2, N3 and N4 of 53dBA, 52dBA, 50dBA and 47dBA were above the SANS guidelines maximum limit rating of 45dBA.

The identified noise sources contributing to the daytime ambient noise levels at the various measurement locations are presented in Appendix L.

The results from the measurements suggest that the overall ambient noise levels of the receiving environment do not comply with the acceptable standards for daytime noise in rural areas.

11.11.2.2 Night-Time Results

The LAeq night-time ambient noise level measured throughout the measuring period for all monitoring locations was 46 dBA which is above the SANS guidelines maximum limit rating of 35 dBA allowable for outdoor night-time ambient noise in rural districts. The LAeq night-time ambient noise level at all measurement locations of 33dBA was below the SANS guidelines maximum limit rating of 35 dBA. The LAeq night-time ambient noise level at measurement locations N1, N2, N3 and N4 of 50dBA, 50dBA, 44dBA and 47dBA were above SANS guidelines maximum limit rating of 35dBA.

The identified noise sources contributing to the night-time ambient noise levels at the various measurement locations are presented in Appendix L.

The results from the measurements suggest that the ambient noise levels of the receiving environment do not comply with the acceptable standards for night-time noise in rural areas.

11.12 Heritage Assessment

The Heritage Impact Assessment was conducted during the EIA Phase and appended hereto as Appendix M.

The following sections describe the observations made during the survey and the outcomes of the survey.

11.12.1 Existing Environment

The Project area has been disturbed through anthropogenic activity, farming and mining activities. Houses and modern structures, agricultural infrastructure (including cattle kraals, dams and boreholes), electrical infrastructure, and informal/untarred roads have been established within the Project area. Part of the area had recently been burned, which improved visibility. In other areas, the natural grass was overgrown, limiting ground visibility. Some other areas had been disturbed through animal activity. Burrows were inspected for the presence of any archaeological materials.

Figure 11-35: The Existing Environment at the Time of the Pre-disturbance Survey

11.12.2 Newly-Identified Heritage Resources

Table 11-37 includes descriptions of the heritage resources identified during the pre-disturbance and ground-truthing surveys. Figure 11-36 below presents photographs of heritage resources identified during the pre-disturbance survey and conditions at the time of the survey. Spatial distribution of these sites and includes the tracks, indicating the areas that were surveyed, refer to Appendix M.

A preliminary assessment of the Genealogical Society of South Africa (Google Earth Cemetery Initiative, 2011) database did not indicate additional burial grounds are known to exist within the Project area.

Table 11-37: Heritage Resources Identified Through the Pre-Disturbance Survey[3]

Site Name	Description
BGG-001	Burial ground of approximately 19 graves. These are marked through various dressings, including: cement fittings, brick fittings, possible laterite and stone and soil heaps, with or without headstones. Headstones consist of cement or a single upright stone or brick. Two headstones have legible inscriptions although only one has a legible date (1985). The burial ground had a fence at some time, but this is now in a state of disrepair.
HST-001	Remains of what appears to be a one-roomed structure built on a small platform / raised foundation. The structure has one door and no windows were present. The structure was made of stone and plaster. The structure is surrounded by four small rectangles made of brick – it would appear these are gardens.

Graves at BGG-001

Remains of main structure at HST-001

Figure 11-36: Photographs of Select Heritage Resources Identified During the Pre-disturbance Survey

11.12.3 Results of the Historical Layering

Figure 11-37 below presents the results of the historical imagery. There is a gap in the historical imagery, as seen in the figure. It appears that this area was never photographed, as the flight plan that should have included the northern portion of the Project area include photographs of the area beyond the Project extent. The age of any structures in this section of the Project area must therefore be verified through other means before they are impacted by the Project.

[3] In accordance with SAHRA procedures, the GPS co-ordinates of these heritage resources have not been included in documents available to the public.

HST-001 is not visible on the imagery; however, features in this area suggest there is a structure present and HST-001 is therefore assumed to represent the historical built environment. The historical imagery presents a landscape that is a mix of cultivated land and natural flora. Some parts of the Project area include large stands of dense trees. There are several roads within the Project area, some of which are still in use today.

Several additional points of interest have been included in Figure 11-37. These represent potential structures or werfs which, if still standing, will be considered built heritage resources. These structures will be afforded general protection under Section 34 of the NHRA.

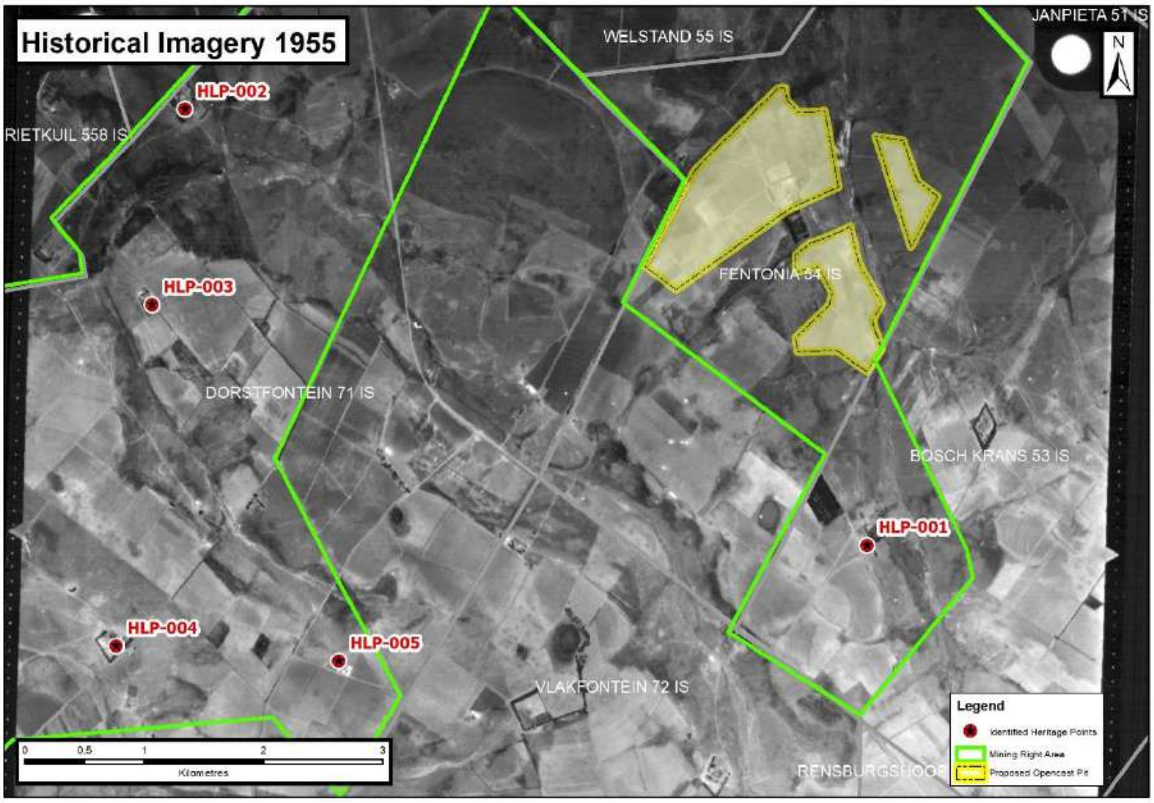


Figure 11-37: Historical Imagery Showing the Project Area in 1955 with Points of Interest

11.13 Traffic and Transport Assessment

The Traffic Impact Assessment (TIA) was conducted by EDL Engineers (Pty) Ltd (EDL) and is attached to this report as Appendix O. The study was undertaken to investigate the passing and new traffic that will be generated by the colliery, and to quantify, as well as evaluate its impact on the existing road network.

11.13.1 Surrounding Road Network

The following roads are relevant to the study area:

- **R547:** This road functions as a Regional Distributor (Class 2) and continues, west and north of its 4-way stop intersection with the R544. It runs about 2 km north-west of the existing mining area, in a north-east / south-west direction to and from Kriel, turning north at the mentioned intersection, to Emalahleni, with an observed speed limit of 60 km/h near the study site. This road is a single carriageway road with no median and one lane in each direction. Manually undertaken traffic counts indicate that this road carries traffic volumes of between 145 vehicles per hour (vph) and 255 vph per direction during the weekday morning (AM) and afternoon (PM) peak hours.
- **R544:** This road functions as a Regional Distributor (Class 2) and continues south and east of its intersection with the R547, about 2 km north-west of the study site. This road has an observed speed limit of 80 km/h, in the vicinity of the intersection of the R544 and D1947. This road is in a poor condition near this mentioned intersection. This is a surfaced single carriageway road with one lane per direction near the study site. Manually undertaken traffic counts indicate that the north-eastern leg of this road carries traffic volumes of between 100 vph and 185 vph per direction during the weekday morning (AM) and afternoon (PM) peak hours. The south-eastern leg of this road is a lot less busy with volumes of lower than 35vph during the mentioned peak hour periods.
- **D1947:** This road, which is classified as a District Collector (Class 4) and falls under the jurisdiction of the Mpumalanga Department of Public Works, Roads and Transport (MDPWRT), provides access to several mining developments along its length. This is a gravel road, predominantly, with space for one vehicle travelling per direction, running in a north-west / south-east direction between the R544 north and R544 south. This road intersects the R544 to the north and south by means of T-junction intersections with the R544 having the Right of Way. The northern intersection with the R544 is in a poor condition and upgrades are proposed within Chapter 8. Manually undertaken traffic counts indicate that this road carries traffic volumes of between 10vph and 80vph per direction during the weekday morning (AM) and afternoon (PM) peak hours.

11.13.2 Future Road Network

There are no new roads / streets planned within the immediate vicinity of the colliery which might impact the expansion of the colliery, nor its operations. For any other possible upgrades, please refer to Chapter 5, or Chapter 8 of the Traffic Impact Assessment Report appended hereto as Appendix O.

11.13.3 Existing Traffic Flows

As a result of the existing surrounding roads, and coal mine, as well as the number of vehicles trips the expanded operations is expected to generate per hour, during weekdays, the study area was defined to include three key intersections, which were analysed using SIDRA 9™.

Weekday Morning and Weekday Afternoon Traffic Counts were therefore carried out during the Weekday Morning (AM) and Weekday Afternoon (PM) commuter peak periods, in August of 2021, at the following identified intersections:

Key intersections:

- R547 & R544;
- R544 & D1947 north; and
- R544 & D1947 south.

Note on COVID-19: Please note that the traffic counts were done, during normal peak hour traffic conditions on a weekday, within a period of relaxed lockdown restrictions, when all the schools were open, and therefore no adjustments to the traffic volumes were deemed necessary.

11.14 Socio-economic Assessment

The Socio-economic Impact Assessment undertaken during the EIA Phase is appended to this report as Appendix P. This section introduces the socio-economic baseline profile of the area and considers the existing impact that the Dorstfontein Mines (both West and East) have on the socio-economic environment.

11.14.1 Secondary Study Area

As previously indicated, the secondary study area refers to the area that is most likely to experience induced impacts brought on by the Project. Induced impacts refer to those impacts that are not directly caused by the Project but occur as an unplanned consequence of it. Typical examples of induced impacts are an increase in the local population size due to the arrival of a construction team or job seekers, which in turn leads to an increase in a demand for housing and services.

Areas that are likely to experience induced impacts are usually the closest formal human settlements as these areas already have formal housing and services available. In the case of the Project, this is likely to be Thubelihle and Kriel.

Thubelihle is directly opposite the Dorstfontein West mine and falls within ELM Ward 15 and was therefore included in the primary study area. It is more likely that job seekers would settle in Thubelihle (as opposed to Kriel) due to its proximity to the mine, and the mixture of formal and informal housing in this area.

A baseline profile of Kriel was not included in the SIA Scoping report but is included here as the other formal area of human settlement consisting of formal housing and services (municipal and otherwise, e.g., shops, doctors, schools, etc.). Kriel is made up of two municipal wards, namely ELM Wards 26 and 27. A comparative and combined overview of these two Wards are presented in the following subsections to provide an overview of the town itself. It should be noted that Ward 27 also consists of vast pockets of agricultural land that could skew the population density for this portion of Kriel.

11.14.1.1 Population Demographics

Wards 26 and 27, have covers a combined geographical area of 380 km^2 and is collectively home to 18 111 people. Ward 26 is an urban ward whereas Ward 27 is a combination of urban and rural, which accounts for the difference in geographical areas – 5.6 km^2 (Ward 26) and 374.4 km^2 (Ward 27). The population densities in the two wards also differ significantly – 20 people per km^2 in Ward 27 against Ward 26's 1 888 people per km^2 - the latter is characteristic of an urban setting.

Both wards have a mixture of Black African and White people as their predominant population groups, with the former in the majority at around 60% and the latter averaging at around 38% of the total population. There are slightly more males than females in both wards at an average of around 54%. Afrikaans is the language spoken by most (around 34% of the population), followed by Zulu (around 24%). Most of Ward 26's population are native to Mpumalanga (55%), followed by significant influxes from mostly Kwazulu-Natal (10%) and Gauteng (9%). Interestingly, less than half (47%) of the rural population in Ward 27 were born in Mpumalanga. This ward also experienced significant population influx from Gauteng and Kwazulu-Natal (10% each) and the Eastern Cape (8%). This migration pattern in these two wards is suggesting that in- and out-migration are already taking place in the area and could be as a result of the presence of coal-fired power stations and coal mines in the area (responsible for in-migration when people come to the area in search of employment) causing land use changes from, for example, agriculture to mining (responsible for out-migration when people leave the area due to job losses).

An overview of the secondary study area's education profile is provided in Figure 11-38. The overall educational level of the area appears to be low with less than half of the adult population (those aged 20 years and older) having completed Grade 12. More people in Ward 26 (46%) completed their secondary education when compared to Ward 27 (39%). Because of this, more people in Ward 26 (7.8%) have completed a tertiary education than in Ward 27 (6.6%).

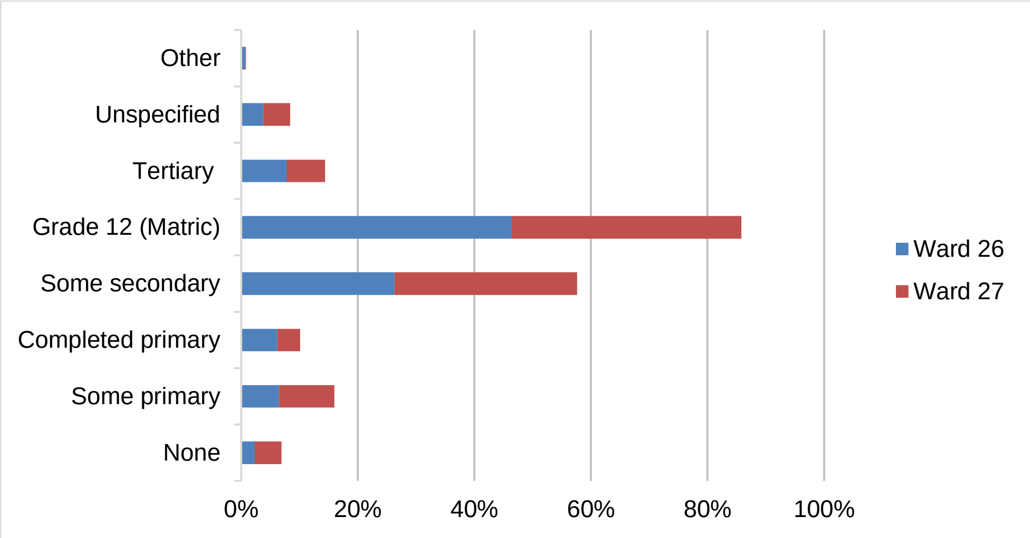


Figure 11-38: Education Profile of the Secondary Study Area

11.14.1.2 Household Characteristics

The study area consists of around 5 850 households, of which 3 350 are in Ward 26 and the remaining 2 500 in Ward 27. Most households are male headed (77% in Ward 26 and 86% in Ward 27). The types of dwellings in Ward 26 are mostly formal brick houses (79%), whereas the types of dwellings in Ward 27 are more diverse – ranging from a formal brick house (58.5%) to rooms or flatlets (13%), apartments at eight percent (8%) and other (around 19%). The total number of dwellings that are considered informal in the study area amounts to around 165 dwellings. Ward 26 have a slightly higher percentage of informal dwellings than Ward 27 (3.3% compared to 2.2%).

Most households receive their water from a regional or local service provider – 96% in Ward 26 and 80% in Ward 27. The decreased percentage in Ward 27 is likely due to the parts of the ward being occupied by agricultural land and in such instances, piped water becomes a challenge due to the distance from a main centre. Most households have access to a flush or chemical toilet (98% in Ward 26 and 88% in Ward 27). Refuse is disposed by the local authority on a regular basis for 97% of households in Ward 26 and 81% in Ward 27.

11.14.1.3 Economic Profile

When considering the total population of the secondary study area (see Figure 11-39), the employment rate is between 53% (Ward 26) and 59% (Ward 27). The unemployment rate is low for both areas at around ten percent (10%). About a third of the secondary study area's population are not economically active, i.e., they are either below the age of 15 or over the age of 65 and are therefore not actively participating in the area's economy. This segment of the population is dependent on the economically active population.

To obtain a true reflection of the employment rate in the area, only the economically active population was considered (see Figure 11-40). Amongst those aged 15-64, there are employed, unemployed individuals, as well as discouraged work-seekers (a person who is part of the economically active age group but who is not actively seeking employment and who prefers not to be working). Within this segment of the population, the employment rate is above 80% for both wards, with around 15% of the population being unemployed. Just under four percent (4%) of both wards' economically active population regard themselves as discouraged work-seekers.

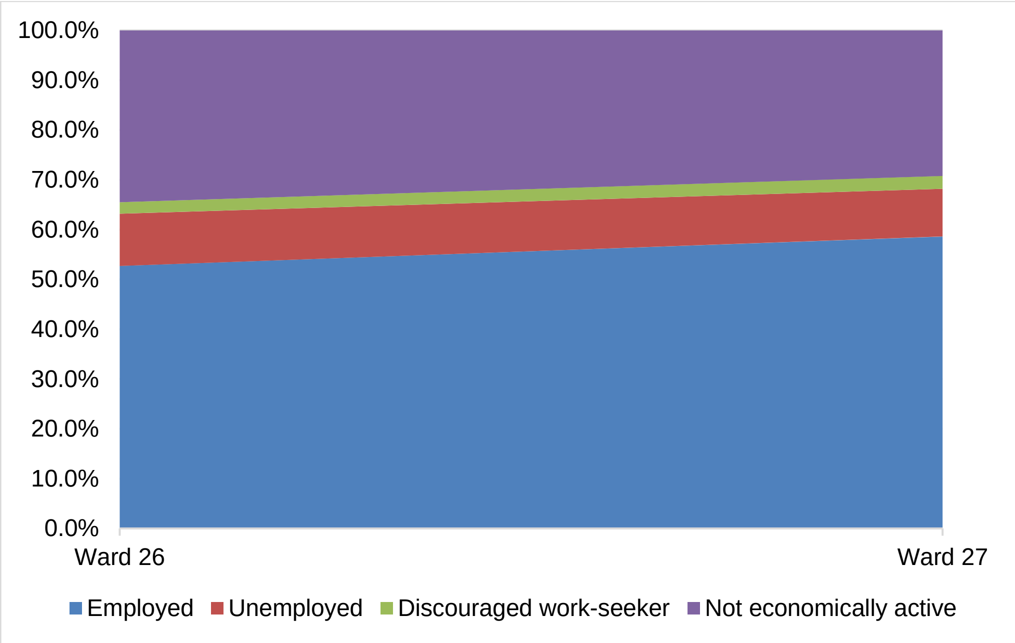


Figure 11-39: Employment Profile of the Secondary Study Area

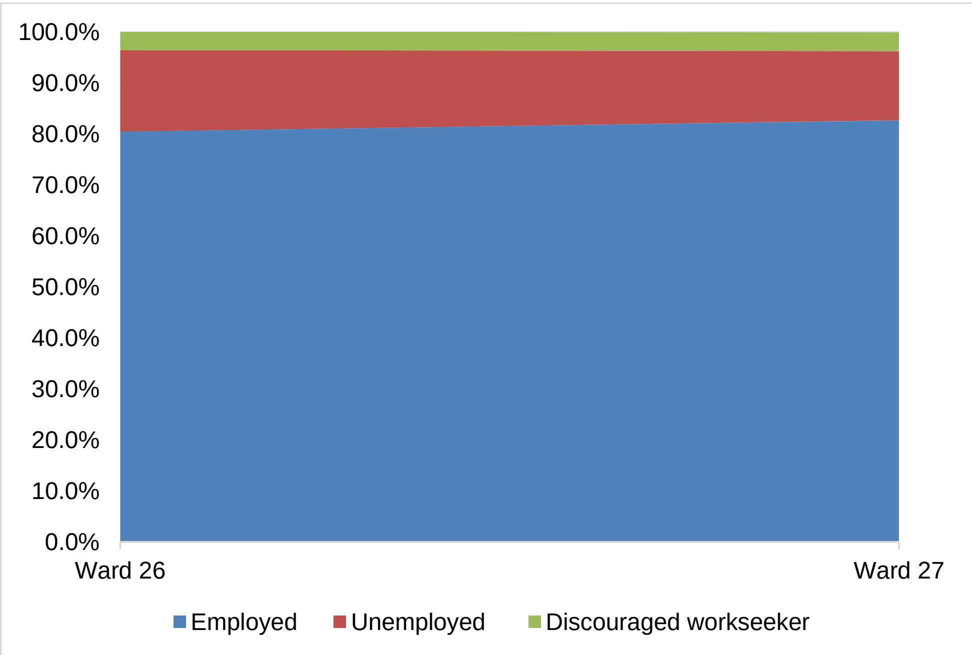


Figure 11-40: Employment Profile of the Economically Active Population

The formal sector accounts for at least 78% of the employment profile in the municipality. Ward 27 has a higher percentage of people employed in the formal sector (14.9%) compared to Ward 26 (7.2%)– this could be indicative of spin-off employment created by the mining and agricultural sector, e.g., food stalls on route to the mine.

Figure 11-41 provides an overview of the annual household income for the secondary study area. Around a quarter of the study area's population live in absolute poverty, which is defined as an annual household income of R 19 200 or less for a family of four (i.e., often these families are unable to meet their basic needs and are dependent on social grants and the goodwill of other people). Most of the population (around two thirds) fall into the lower middle- and middle-income bracket, with between 3-10% of the population in the higher middle- and high-income brackets. On average, households in Ward 26 tend to have a more stable income with most households in the middle to high income brackets.

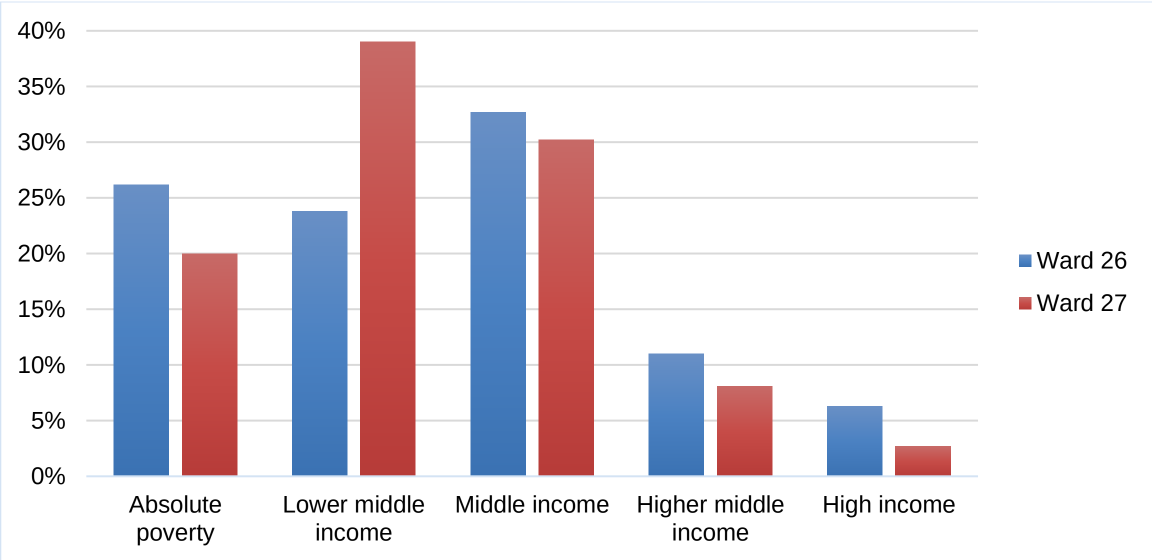


Figure 11-41: Annual Household Income in the Secondary Study Area

Considering that the study area's land use is a combination of agriculture and mining, the assumption is that the local economy would also be more diverse. The more diverse an economy, the more likely it will lead to job creation and a better balance between labour-intensive and capital-intensive industries. However, this implies that there is a need for fast growing industries to also create employment, particularly for the semi-skilled and the unskilled. Unfortunately, in practice, many fast-growing industries are of such a nature that they do not create job opportunities for unskilled labour (e.g., very few such opportunities exist within the mining sector) and therefore these industries do not contribute significantly towards a reduction in unemployment and poverty alleviation in the local area. This is one of the reasons why the MPRDA requires mines to develop an SLP to outline how they would contribute to the socio-economic development of their area of impact.

11.14.1.4 Development Needs

The development needs of Wards 26 and 27 have been identified through the IDP public participation process and is reflected in the ELM IDP of 2020/21. These are shown in Table 11-38 below. Not all the development needs were identified only by the residents of these areas, but that some development needs were identified by the municipality itself. As such some of the development needs listed apply to the wider Kriel area and not just the ward.

Table 11-38: Development Needs in the Secondary Study Area

Area	Identified Development Needs
Ward 26 (Kriel "south")	• Streetlights and poles need to be fixed. Rusted poles cause structure to collapse leaving live wires lying on the pavement that is dangerous to people. • Storm water drains are blocked and must be cleaned and fixed. • Potholes must be fixed throughout the ward. • Parks and other open spaces must be cleaned and maintained. Park next to the municipal offices needs public toilet facilities. • A fire station must be constructed. The traffic department's computer system must be checked so that they are not offline so often. • The current municipal clinic is small and cramped, short-staffed and short on medicine. The site that was set aside for the new clinic in Kingfisher Street must be developed. • The ward requires public amenities such as a community hall, a youth centre, sports grounds, and a play park. • Reconstruction and Development Plan (RDP) houses required.
Ward 27 (Kriel "north" and surrounding agricultural land)	• Maintenance of streetlights and high mast lights. • Fixing of potholes (Merlin, Bokmakierie, Albatross, Nagtegaal and Bosbok Streets mentioned specifically, but can assume that it would be a recurring problem throughout the ward). • Refurbishment of licence office. • Replacement of solar panels in Emaline Street. • Erection of road signs.

11.14.2 Primary Study Area

The primary study area is the area closest to the mine, which is expected to experience the most direct impacts as a result of the physical intrusion of the mine infrastructure and daily mining activities. For the purposes of this Social Impact Assessment (SIA), the primary study area is defined as the area in which the existing DECM is located, as well as the Project stie and the areas adjacent to the mining area, i.e., GMLM Ward 15 and ELM Ward 25.

This section provides a high-level discussion of these areas..

11.14.2.1 Summary of Population Demographics

Table 11-39 provides a summary of the primary study area population demographics. Ward 25 is the most populous of the two Wards with a population of 14 938 and it has a higher population density as well. Most of the population in the Wards are of economically active age groups (19 to 64 years old) with a median age of 26.5 years. Most of the population are Black African and the predominant languages isiZulu, Afrikaans, and isiNdebele. The proportion of males is slightly higher than females across the wards.

Table 11-39: Population Demographics

Variable	GMLM Ward 15	ELM Ward 25	Combined
Geographical area	1 032	223	1 255
Population	10 334	14 938	25 272
Population density	10 / km^2	67 / km^2	20 / km^2 (avg)
Economically active population	61%	63%	-
Largest population group	Black African (72%)	Black African (98%)	Black African
Dominant sex	Male (53%)	Male (52%)	Male
Languages	Zulu (48%) Afrikaans (23%)	Zulu (54%) Ndebele (15%)	Zulu, Afrikaans, and Ndebele
Province of birth	Mpumalanga (65%)	Mpumalanga (76%)	Mpumalanga

11.14.2.2 Summary of Household Characteristics

Ward 25 has nearly double the number of households compared to that of Ward 15 with an average household size of 3.3 persons per household. Most of the households are headed by males with an average of 28% being headed by females. Research indicates that female headed households tend to face greater social and economic challenges and are vulnerable to lower household incomes and higher rates of poverty[4]. Table 11-40 provides a summary of the household characteristics.

Table 11-40: Summary of the Household Characteristics

Variable	GMLM Ward 15	ELM Ward 25	Combined
Number of households	2 871	4 868	7 739
Female headed households	25%	31%	28%
Household size (avg.)	3.6	3.1	3.3

[4] https://www.econrsa.org/system/files/publications/working_papers/working_paper_761.pdf

Variable	GMLM Ward 15	ELM Ward 25	Combined
Sex head of household	Male (76%)	Male (69%)	Male
Average household income	R 29 400 p.a. (R 2 450 p.m.)	R 29 400 p.a. (R 2 450 p.m.)	R 29 400 p.a. (R 2 450 p.m.)

11.14.2.3 Summary of Economic Profile

In both wards, the percentage of the population that has obtained a Grade 12 average 25% and lowest in ELM Ward 25 – with only 22% of the population with a matric or higher education. According to the 2016 Community Survey an average of 50% of the population was employed within the formal economic sector. This may have changed due to Covid-19 and its associated loss of employment.

Table 11-41: Summary of the Population's Education and Employment Status

Variable	GMLM Ward 15	ELM Ward 25	Combined
Education level: matric or higher	32.6%	21.7%	~ 25%
Employment rate[5]	53.4%	46.7%	~ 50%
Economic sector	Formal (74%)	Formal (78%)	Formal

11.14.2.4 Income Profiles

An average of 12% of households within the Wards did not earn an income while an average of eight percent (8%) earned an annual income of less than R10 000 per annum. This signifies that a substantial portion of households are living within the low bound and upper bound poverty line, which refers to the food poverty line plus the average amount derived from non-food items of households whose total expenditure is equal to the food poverty line (see Figure 11-42).

[5] Of the economically active population

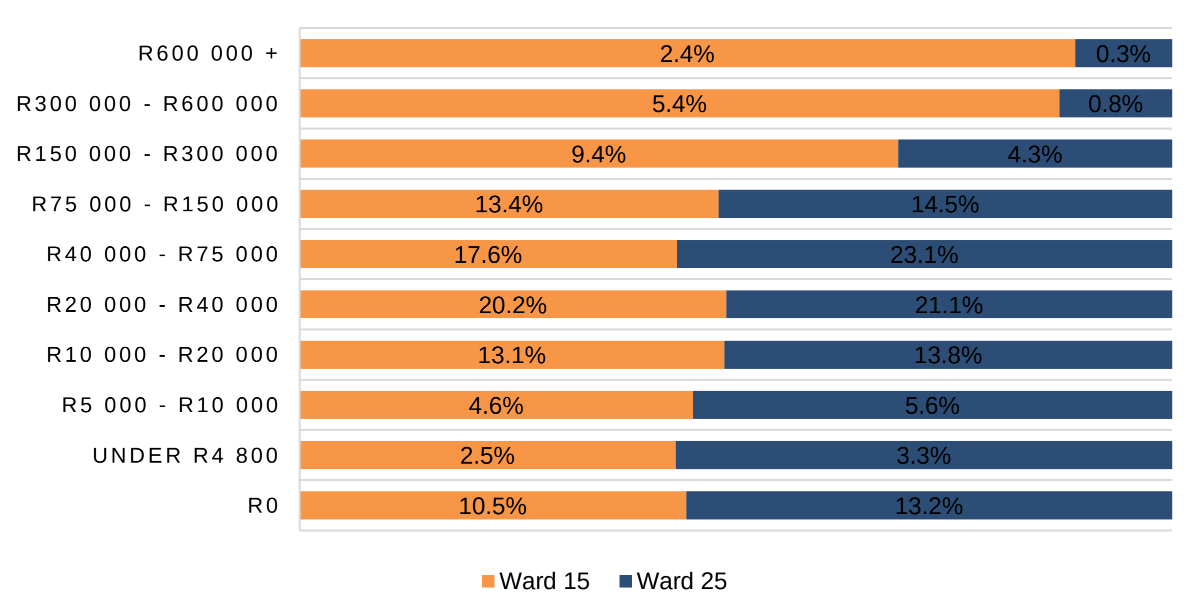


Figure 11-42: Annual Household Income

11.14.2.5 Access to Social Services and Infrastructure

Households residing in Ward 25 were reported to have better access to social services compared to those found in Ward 15. This may be attributed to the economic sectors served by the municipality within which the Ward sits such as mining and power generation. A summary of the indicators related to access to social services and infrastructure is provided in Table 11-42 below.

Table 11-42: Access to Social Services

Variable	GMLM Ward 15	ELM Ward 25	Combined
Water services	Service provider (62%)	Service provider (86%)	Service provider
Toilet facilities	Flush or chemical (59.1%)	Flush or chemical (89.8%)	Flush or chemical
Refuse disposal	Local authority (50.8%)	Local authority (82.2%)	Local authority
Informal dwellings	623 (21.7%)	652 (13.4%)	1 275 (16.5%)

11.14.2.6 Development Needs

Table 11-43 below lists the development needs that were identified for the primary study area, as contained in the IDP.

Table 11-43: Development Needs in the Primary Study Area

Area	Identified Development Needs
ELM Ward 25	• Residential development stands. • RDP houses. • Road and storm water infrastructure. • Combined school. • High mast streetlights. • Formal township establishment for Ext. 6.
GMLM Ward 15	• Regular disposing of sewage through sewage trucks. • Constructing new communal toilet facilities. • Repairing of boreholes and windmills to solve water problems. • Road maintenance. • Allocation of low-cost houses. • Electrification of houses. • Employment creation. • Deploying of LED projects.

11.15 Greenhouse Gas Emissions Assessment

The Greenhouse Gas (GHG) Emissions Impact Assessment was conducted during the EIA Phase and appended hereto as Appendix Q.

The GHG Inventory for the proposed DECM underground mining extension project has been prepared using the ‘Technical Guidelines for Monitoring, Reporting and Verification of GHG Emissions by Industry’, issued by the Department of Environmental Affairs (DEA) in April 2017. The GHG Inventory includes GHG emissions from all three phases of the proposed project, namely construction, operational, and the closure and closure phases.

The total estimated Scope 1 and Scope 2 GHG emissions during the construction phase for the proposed project will be 5 892,76 tonnes Carbon Dioxide equivalent (tCO_2e). The total annual Scope 1 and Scope 2 operational phase GHG emissions for Operational Phase Year-1 is 25 484,15 tCO_2e. The total estimated annual closure and closure phase GHG emissions are estimated at about 5 892,76 tCO_2e.

The majority of GHG emissions associated with proposed extensions to the DECM for the construction and closure phases will be from purchased electricity (Scope 2 emissions). For the operational phase, the most significant emissions will be from fugitive emissions during coal mining, as well as from purchased electricity.

11.16 Visual Assessment

A Visual Impact Assessment (VIA) undertaken during the EIA Phase is appended to this report as Appendix N.

11.16.1 Visual Environment

The expected visual impact of the Project was categorised based on the type of receiving environment and the type of development as detailed in Table 11-44 (Oberholzer, 2005). The table provides an indication of the visual impacts that can be expected for different types of developments in relation to the nature of the receiving environment. Following this classification system, the Project is classed as a Category 5 development. The receiving environment is best described as an area of medium scenic, cultural or historical significance. It is therefore expected that the Project will potentially have a high visual impact on the receiving environment as shown in Table 11-45.

Table 11-44: Key to Categorisation of Development (adapted from Oberholzer, 2005)

Type of Development	Examples of Development
Category 1	Nature reserves, nature related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2	Low-key recreation/resort/residential type development, small-scale agriculture/nurseries, narrow roads and small-scale infrastructure.
Category 3	Low density resort/residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4	Medium density residential development, sports facilities, small-scale commercial facilities/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5	High density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Table 11-45: Categorisation of Expected Visual Impact (adapted from Oberholzer, 2005)

Type of Environment	Type of Development (Low to High Intensity)				
	Category 1 Development	**Category 2 Development**	**Category 3 Development**	**Category 4 Development**	**Category 5 Development**
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high, scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down urban areas/wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

For projects where a high or very high visual impact is expected, Oberholzer (2005) recommends that a Level 4 visual assessment be conducted. A Level 4 visual assessment includes the following:

- Identification of issues raised in the scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Description of alternatives, mitigation measures and monitoring programmes; and

- Complete 3D modelling and simulations, with and without mitigation.

11.16.2 Receptor Identification

An analysis of the various datasets used for the receptor identification indicates the following categories of receptors shown in Table 11-46.

Table 11-46: Receptor categorisation

Identified Receptor Category	Description	Distance from proposed development
Disperse settlements	The project area is characterized by disperse settlements which are located throughout the surrounding farms.	Ranging from immediate vicinity to 20 km.
Town Settlements	Thubelihle	5.1 km
	Kriel	7 - 10 km
	Blesboklaagte	11.2 km
	Vanwyksdrif	11 km
Nature Reserve	None within the Zone of Influence	-
Motorists	R544	2.2 km
	R547	2.2 km
	R545	11 km
Surrounding Coal Mine Operations	Various active and inactive coal mines around the region	Ranging from 1 km to 20 km.

Figure 11-43 provides a spatial representation of the various potential sensitive receptors that have been identified.

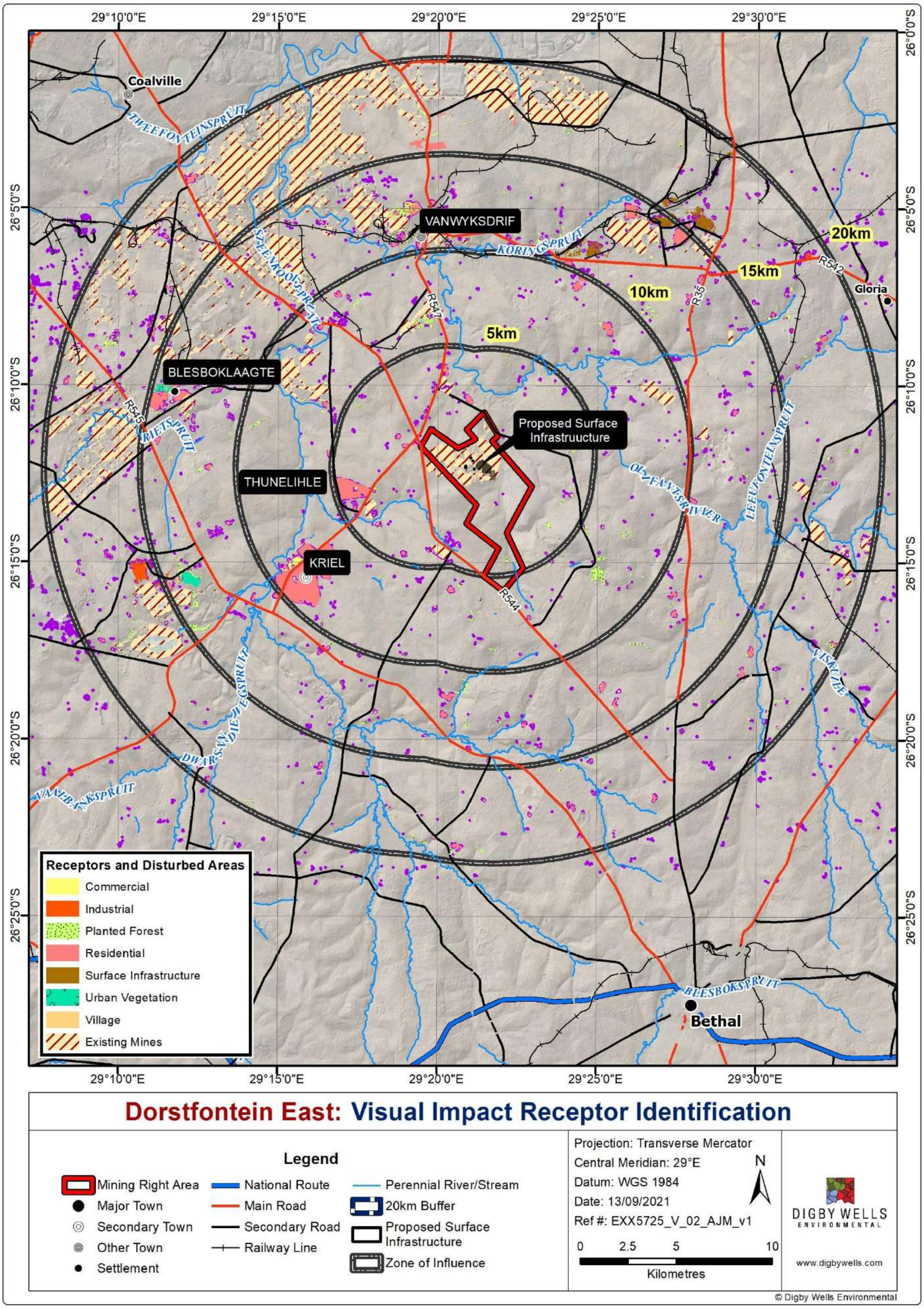


Figure 11-43: Receptor Identification and Distribution

11.16.3 Viewshed Assessment

The results from the viewshed modelling process are presented in this section, where individual viewsheds were run to model the potential impact of the most significant infrastructure features as detailed in Visual Report appended to this report as Appendix N.

11.16.3.1 Discard Wash Plant viewshed results

The results indicate that the discard dump will have the largest potential for visual impact based on the area of visibility. Very high visual exposure is limited to the region within five kilometres of the development area. The results also show that the majority of the visual impact is anticipated to occur to the Norther an Eastern side of the Project area, owing to the visual screening from the topographical variation. Sections along the R547 and R5444 main road are affected by High levels of visual exposure. The visual report shows the extent of the viewshed modelling results from the discard dump. The main contribution is due to the vertical offset of 15 m, which is anticipated to be the highest feature from the operational phase of the proposed new infrastructure.

11.16.3.2 Office, Main Workshop and Ventilation Fan results

The results from the Office, Main Workshop and Ventilation area viewshed analysis indicate that most of the visual exposure is expected to be restricted to the immediate region, with high visual exposure also occurring to the North-East of the Project are within ten to twenty kilometres of the proposed development area. The highest degrees of visual exposure are anticipated to occur to the immediate East and North-East of the project development area, within a five kilometre proximity of the proposed development area. Extensions of moderate and low level exposure are seen towards the north of the Project development area, which is already exposed to existing mining infrastructure, such as the discard dump, berms and existing open pits. A potential moderate visibility location is identified along the R544 and R547. The visual report shows the extent of the viewshed modelling results from the office, workshop, and ventilation fan area.

Table 11-47 provides details on the locations of the identified receptors and provides suggested mitigation measures for the short-listed receptors that would potentially have a high to very high visual impact.

Table 11-47: Receptors within 5-kilometer Zone of Influence

Map ID	Category	Farm Portion	Latitude	Longitude	Exposure (Mitigation Suggestion)
1	Farmstead	Vlaklaagte 45 IS Ptn RE/8	26° 11' 44.658" S	29° 22' 54.871" E	Very High (Suggested Mitigation)

Map ID	Category	Farm Portion	Latitude	Longitude	Exposure (Mitigation Suggestion)
2	Farmstead	Janpieta 41 IS Ptn RE	26° 13' 6.207" S	29° 24' 6.632" E	High (Suggested Mitigation)
3	Homesteads	Rietkuil 57 IS Ptn 16	26° 11' 43.414" S	29° 18' 59.282" E	Moderate (No Mitigation required)
4	Farmstead	Rietkuil 57 IS Ptn 2	26° 11' 27.098" S	29° 18' 44.136" E	Moderate (No Mitigation required)
5	Homesteads	Rietkuil 57 IS Ptn 16	26° 11' 39.738" S	29° 19' 18.400" E	Moderate (No Mitigation required)
6	Farmstead	Welstand 55 IS Ptn RE/6/55	26° 10' 54.300" S	29° 19' 29.349" E	Moderate (No Mitigation required)
7	Homesteads	Welstand 55 IS Ptn RE/7/55	26° 10' 40.653" S	29° 19' 39.377" E	Moderate (No Mitigation required)
8	Mining Operations	Lourens 472 IS Ptn 29	26° 10' 6.048" S	29° 20' 18.535" E	High (Suggested Mitigation)
9	Mining Operations	Lourens 472 IS Ptn 29	26° 10' 24.119" S	29° 20' 57.844" E	Very Low (No Mitigation required)
10	Farmstead	Lourens 472 IS Ptn RE	26° 9' 37.905" S	29° 20' 12.415" E	High (Suggested Mitigation)

12 Methodology Used in Determining and Ranking the Nature, Significance, Consequence, Extent, Duration and Probability of Potential Environmental Impacts and Risks

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 12-2. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this EIA Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 12-3, extracted from Table 12-2. The descriptions of the significance ratings are presented in Table 12-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 12-1: Impact Assessment Parameter Ratings

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the Project.	Definite: There are sound scientific reasons to expect that the impact will occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond Project life: The impact will remain for some time after the life of the Project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the Project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	<u>Local</u> Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur. <25% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low because of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 12-2: Probability/ Consequence Matrix

	Significance																																					
Probability 7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Consequence																																					

Table 12-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the Project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)

Score	Description	Rating
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

13 Impacts and Risks Identified Including the Nature, Significance, Consequence, Extent, Duration and Probability of the Impacts, Including the Degree to which these Impacts

This section aims to rate the significance of the identified potential impacts pre-mitigation and post-mitigation. The potential impacts identified in this section are a result of both the environment in which the Project activity takes place, as well as the activity itself. The identification of potential impacts is performed by determining the potential source, possible pathways and receptors. In essence, the potential for any change to a resource or receptor (i.e. environmental aspect) brought about by the presence of a Project component or by a Project-related activity has been identified as a potential impact.

The potential impacts are discussed per environmental feature/ aspect and according to each phase of the Project i.e. the Construction, Operational and Closure/ Post-Closure Phases. The significance, probability and duration of these potential impacts have been assessed based on the detailed specialist studies undertaken on the sensitivity of the receiving environment. The main Project activities to take place during the construction, operational and closure phases may pose potential impacts on the receiving environment and are described in Table 5-1 above.

13.1 Impacts and Mitigations per Project Phase

The potential impacts that were identified for the construction, operational and closure phases, are discussed in Table 13-2. The impact matrix abbreviations used in Table 13-2 are provided in Table 13-1 below.

Table 13-1: Impact Matrix Abbreviations

Abbreviation	Definition
D	Duration
E	Extent
I	Intensity
P	Probability

Table 13-2: Impact Assessment associated with the Construction, Operational and Closure Phases

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Access road construction, movement of vehicles, and heavy machinery.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; and • Increased erosion and consequently sedimentation potential.	5	3	4	5	Moderate (negative) - 60	• Keep site clearing to a minimal • While soils are being stockpiled, the soils should be revegetated to limit erosion and loss of organic material; • Establishment of effective vegetation around constructed infrastructure for adequate soil protection from wind and water erosion; • If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals or after high rainfall events; and • Runoff must be controlled and managed by the use of proper stormwater management measures.	4	2	2	4	Negligible (negative) - 32
Construction	Site clearing and preparation by the removal of vegetation and topsoil, leading to the exposure of soils for site establishment.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Increased wind and water erosion and consequently sedimentation potential; • Removal of vegetation and basal cover resulting in loss of topsoil, organic material and increased erosion potential; and • Compaction, ponding, and changing the natural landscape of the area.	5	4	5	6	Moderate (negative) - 84	• . Keep site clearing to a minimal • While soils are being stockpiled, the soils should be revegetated to limit erosion and loss of organic material; • Establishment of effective vegetation around constructed infrastructure for adequate soil protection from wind and water erosion; • If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals or after high rainfall events; and • Runoff must be controlled and managed by the use of proper stormwater management measures.	4	2	2	4	Negligible (negative) - 30

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Construction of surface infrastructure	Soil, Land Use, and Land Capability	• Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Increased hardened surfaces resulting in increased hydrological functioning; • Diggings, removal, and shifting of soil; • Potential spillage of sewage wastewater and hydrocarbons such as oils, fuels and grease, thus contamination of the soils; and • Increased dust, erosion, and sedimentation.	5	4	5	6	Moderate (negative) - 84	• Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Increased hardened surfaces resulting in increased hydrological functioning; • Potential spillage of hydrocarbons such as oils, fuels and grease, thus contamination of the soils; and • Increased dust, erosion, and sedimentation	4	2	2	4	Negligible (negative) - 30
Construction	Waste management activities, including: • In-pit RoM Stockpiling; • Handling of hydrocarbon chemicals; • Hauling and transportation of waste material; • Transportation of product coal; and Disposal of waste material	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Soil contamination from sewage and wastewater; and • Soil compaction resulting from the movement of heavy machinery within the Project Area.	5	3	3	6	Minor (negative) - 66	• Runoff must be controlled and managed by the use of proper stormwater management measures; • Vehicles should regularly be surveyed and checked that oils spills and other contaminants are not exposed to the soils; • Re-fuelling must take place on bunded impervious surfaces to prevent seepage of hydrocarbons into the soil; • All vehicles and machines must be parked within hard park areas and must be checked daily for fluid leaks; and • Fuel, grease, and oil spills should be remediated using a commercially available emergency clean up kits. However, for major spills (>5 L), if soils are contaminated, they must be stripped and disposed of at a licensed waste disposal site.	4	2	1	4	Negligible (negative) - 29
Construction	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	5	4	4	4	Minor (negative) -52	• All vehicles operating on the site should be regularly checked for hydrocarbon leaks; and • All refuelling and servicing should be undertaken within bunded designated areas to avoid hydrocarbons reaching the surrounding environment.	5	1	2	4	Negligible (negative) -32
Construction	Construction of infrastructure, and ventilation Shafts.	Fauna and Flora	• Increased faunal casualties; and • Changes to the landscape, causing ponding and undulating topographies.	5	2	3	4	Minor (negative) -40	• Toolbox talks regarding vehicle speed limits should be regularly implemented; and • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions.	5	2	3	2	Negligible (negative) -20

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	5	3	3	4	Minor (negative) -44	• An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been damaged and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present; • Dust suppression techniques should be implemented on all access and haul roads; • Toolbox talks regarding vehicle speed limits should be regularly implemented; and • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions.	5	2	3	2	Negligible (negative) -20
Construction	Stockpiling of soils, rock dump	Fauna and Flora	• Compaction of soils; • Low vegetation growth. If stockpiles unvegetated, potential erosion • Increased run off and erosion.	5	3	3	4	Minor (negative) -44	• AIPs should be continuously monitored and controlled throughout the life of the mine; and thereafter, with the establishment of an AIP Eradication Plan; • Once construction is complete, the environmental officer must ensure the construction areas are rehabilitated to an acceptable standard to accomplish the aim of the rehabilitated area. Open and steep areas are prone to erosion and these must be marked and attended to before the following wet season starts; • Rehabilitation of disturbed areas should take place within a month of construction. All bare patches of soil should be vegetated, preferably with pioneer species which will colonise open and disturbed areas relatively quickly and prevent erosion and alien vegetation establishing; • No harvesting of floral or poaching of faunal species may take place by the construction employees; and • No dirty water may be disposed of In the immediate environment.	3	2	3	3	Negligible (negative) -24
Construction	Access road construction,	Wetlands	• Erosion and sedimentation; and • Soil compaction and or disturbance.	5	2	5	5	Minor negative (-60)	• At areas where road crossings have been designed, these roads should cross wetland or river features at the narrowest point and a 90-	4	1	3	4	Minor negative (-32)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									degree angle with suitable drainage designed into the relevant bridge/culvert crossing; • Environmental Practitioner and botanist to be present during vegetation clearing to prevent unnecessary clearing of extensive areas not part of the direct footprint area; and • Bare land surfaces must be vegetated to limit erosion from surface runoff associated with infrastructure areas. Revegetate disturbed areas immediately after construction.					
Construction	Site clearing, including the removal of vegetation and disturbance of soils	Wetlands	No wetlands will directly be impacted, however secondary impacts might occur as activities are proposed within 100 m and 500 m of wetlands. Secondary impacts include: • Erosion and sedimentation; • Loss of fauna and flora (biodiversity); and • Increased AIPs.	5	2	2	3	Negligible (-27)	• Environmental Practitioner and botanist to be present during vegetation clearing to prevent unnecessary clearing of extensive areas not part of the direct footprint area; • Monitor and rehabilitate cleared and impacted areas where necessary; • Bare land surfaces must be vegetated to limit erosion from surface runoff associated with infrastructure areas; and • Limit vegetation removal and construction activities to the infrastructure footprint area only, where removed or damaged vegetation areas should be revegetated as soon as possible with a suitable mix of plant species as determined by a qualified botanist.	3	1	1	2	Negligible negative (-10)
Construction	Construction of mine related surface infrastructure	Wetlands	• Increased hardened surface, runoff and onset of erosion and sedimentation; • Decreased wetland habitat, functionality and integrity; • Soil, water and wetland contamination.	6	3	6	4	Minor negative (-60)	• Wherever possible, surface infrastructure and vehicle movement should be placed outside wetlands and the 100 m Zone of Regulation to prevent impacts such as increased hardened surfaces, runoff, contamination, erosion and sedimentation; • All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off-limits to all unauthorised vehicles and personnel; • Limit vegetation removal and construction activities to the infrastructure footprint area only, where removed or damaged vegetation areas	5	2	4	3	Negligible negative (-33)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									should be revegetated as soon as possible with a suitable mix of plant species as determined by a qualified botanist; • All spills must be cleaned up immediately to prevent contaminants to enter the wetlands; and • Monitor rehabilitated areas to ensure successful re-establishment of vegetation and assess/prevent AIPs proliferation as well as monitor erosion, canalisation, and changes to the systems.					
Construction	Waste management activities	Wetlands	• Contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland health and biodiversity.	7	3	7	5	Moderate (negative) – 85	• A Storm Water Management Plan (SWMP) should already be implemented. This should consider all wetlands and other watercourses associated with the new developments/infrastructure which should divert stormwater away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible; • The SWMP should convey stormwater to silt traps to limit erosion and the subsequent increase of suspended solids in downstream watercourses; • The SWMP should convey contaminated water away from wetlands and freshwater systems; • Freshwater resource monitoring must be carried out during the construction phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; • Care must be taken to ensure that contamination of the receiving environment as a result of mining activities is minimized as far as possible; • Chemicals, such as paints and hydrocarbons, should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; and	6	2	6	4	Minor negative (-65)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• All spills should be immediately cleaned up and treated accordingly.					
Construction	Site clearance and construction of proposed infrastructure.	Aquatics	• Land and vegetation manipulation/clearing in proximity to the watercourses.	5	3	-4	5	Minor (negative) – 60	• General mitigation actions provided in the wetlands and surface water studies conducted by Digby Wells should be used to guide the effective management of aquatic resources potentially affected by the proposed Project. However, more specific management actions for the Construction Phase are listed below: • Limit vegetation removal to the infrastructure footprint area only. Where removed or damaged, vegetation areas (riparian or aquatic related) should be revegetated as soon as possible; • Bare land surfaces downstream of construction activities must be vegetated to limit erosion from the expected increase in surface runoff from infrastructure; • Environmentally friendly barrier systems, such as silt nets or, in severe cases, use trenches downstream from construction sites to limit erosion and possibly trap contaminated runoff from construction; • Storm water must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; • Water used at construction sites should be utilised in such a manner that it is kept on site and not allowed to run freely into nearby watercourses (i.e. use of a PCD); • Construction chemicals, such as paints and hydrocarbons, should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; • All vehicles must be frequently inspected for leaks; • No material may be dumped or stockpiled within any rivers, drainage lines in the vicinity of the proposed project; • All waste must be removed and transported to appropriate waste facilities; and	5	2	-2	3	Negligible (negative) – 27

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• High rainfall periods (usually November to March) should be avoided during construction to possibly avoid increased surface runoff in attempt to limit erosion and the entering of external material (i.e. contaminants and/or dissolved solids) into associated aquatic systems.					
Construction	Site preparation including vegetation clearance and excavations, leading to exposure of soils.	Hydropedology	• Siltation and sedimentation of water resources leading to deteriorated water quality.	5	4	3	6	Minor (negative) - 72	• Buffer zones need to be delineated and established as specified in the Wetlands report (Digby Wells , 2020) to prevent the destruction of wetlands within DECM;	2	2	2	3	Negligible (negative) - 18
Construction	Handling of hydrocarbons and other chemicals; Loading, hauling and transportation of product coal.	Hydropedology	• Contamination of water resources leading to deterioration of water quality.	6	5	3	5	Minor (negative) - 70	• Developments near undisturbed wetlands need to be avoided as much as possible; • Rehabilitate the land to the most suitable post-mining land use; • The discard dump should be lined with an impermeable layer to prevent groundwater contamination; • Clearing of vegetation must be limited to the development footprint, and the use of any existing access roads must be prioritised to minimise creation of new ones; • Dust suppression on the haul roads and other cleared areas must be undertaken on regular basis to prevent or limit dust generation; • Hydrocarbon and hazardous waste storage facilities must be appropriately bunded to ensure that leakages can be contained. Spill kits should be in place and construction workers should be trained in the use of spill kits, to contain and immediately clean up any leakages or spills; • Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected daily before use to ensure there are no leakages underneath; and • Drip trays must be used to capture any oil leakages. Servicing of vehicles and machinery should be undertaken at designated hard park areas. Any used oil should be disposed of by accredited contractors.	5	2	2	2	Negligible (negative)-18

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Site preparation and excavations. Stockpiling of spoils and discard.	Surface water	• Sedimentation and siltation of nearby watercourses most likely leading to deteriorated water quality.	5	2	3	4	Minor (negative)- -40	The following mitigation measures are recommended during the construction activities: • Site preparation for the construction of infrastructure should be confined to the existing development footprint area to minimise disturbance of soils and the probability of sedimentation and siltation of the nearby watercourses. • Ensure that additional proposed infrastructure should be within the existing storm water management plan as proposed, to ensure continued control of any dirty runoff on site. • Construction should be undertaken during the dry winter period to reduce sedimentation in nearby watercourses since there will be minimal to no occurrence of rainfall. • All storage areas (fuels, paints, oils) used at the construction camp should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills.	2	2	3	2	Negligible (negative) - 14
Construction	Washing off, of oils, fuels and other hydrocarbon spills during the construction of facilities such as offices, ablutions, storerooms, workshops, storage dams, process plant, roads, pipelines, power lines and conveyors.	Surface water	• Surface water contamination and deterioration of water quality.	5	4	2	5	Minor (negative) - 55		2	2	2	2	Negligible (negative) - 12
Construction	Site Clearing, Construction of Haul Roads and Surface Infrastructure.	Air Quality	• Reduction in ambient air quality.	1	2	2	6	Negligible (negative) – 30	• Application of a dust suppressant on the haul roads and exposed areas; • Limit activity to non-windy days (wind speed less than 5.4 m/s); • Set maximum speed limits on haul roads and have these limits enforced; • The area of disturbance must be kept to a minimum at all times and no unnecessary clearing, digging or scraping must occur, especially on windy days; and • The drop heights when loading onto trucks and at tipping points should be minimised.	1	1	1	4	Negligible (negative) – 12
Construction	Site/vegetation clearance for site establishment (infrastructure including ventilation fans, change houses, offices, ablutions, and workshops)	Noise	• Noise will emanate from the machinery and vehicles operating during the construction activities.	2	2	2	3	Negligible (negative) – 18	• Construction activities should be restricted to daylight hours; • Construction machinery and vehicles should be switched off when not in use; • Construction vehicles should have white noise reversing alarm (buzzer type reverse alarms)	2	1	1	3	Negligible (negative) – 12
Construction	In-pit RoM Stockpiling	Noise												

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Access road construction	Noise							installed, rather than the conventional beeping type reverse alarms; • Vehicles to be serviced as per their design requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Regulate vehicle speeds on the access and haul roads.					
Construction	Power line construction.	Noise	• Noise impacts are considered to be negligible therefore was not assessed further.											
Construction	Construction of infrastructure.	Noise	• Noise emissions from equipment/machinery will increase the noise levels at sensitive receivers but not enough to result in a noise disturbance											
Construction	Removal of vegetation / topsoil for establishment of mining and linear infrastructure	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation. • Potential for dust pollution.	2	3	-2	7	Minor (negative) -49	• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • Make use of existing roads to encourage minimal impacts/footprint; • The footprint of the proposed mining operations should be limited to the extent of the infrastructure where possible.	2	2	-2	3	Negligible (negative) -18
Construction	Construction of infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	3	2	-3	7	Minor (negative) -56	• All buildings and reflective surface must be limited in height and be painted natural hues to limit the extent and intensity of the visual impact. This is particularly relevant to the Discard Wash plant; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after construction or apply dust suppression techniques where applicable.	3	2	-2	6	Minor (negative) -42
Construction	Temporary employment creation	Socio-economic	• Temporary economic injection through income, mostly on an individual or household level.	3	2	1	4	Negligible - positive (24)	• Advertise any local employment opportunities in local community papers and at venues frequented by community members (e.g., community hall, municipal offices, etc.). • Develop and maintain a database of job seekers who apply for any job advertised through the above-mentioned measures. • Do not employ at the gate. Employment at the gate of day labourers will stimulate an influx of job seekers and crowds gathering at the work site; and • Ensure that local communities are aware of and have easy access to the mine’s grievance mechanism so that they can register complaints	3	3	2	5	Minor - positive (40)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									around employment practices. This will also allow the mine with opportunities to address any legitimate complaints.					
Construction	Project-induced in-migration	Socio-economic	• A temporary increase in certain segments of the population can place additional strain on housing and services.	2	3	-2	4	Negligible - negative (-28)	• Discourage in-migration from other areas by focusing employment opportunities at the local community and widely publicising this intent, and refrain from employing day labourers at the gate. Maintain a job seeker register and only employ people who are registered on this database and who have been verified as being from the local area. • Engage with local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues related to in-migration.	1	2	0	2	Negligible (0)
Construction	Surface preparation for infrastructure	Heritage	• Direct negative impacts to BGG-001	7	7	-7	6	Major (negative) (-126)	• The project related mitigation must aim to amend the project design to avoid the potential negative impact to the heritage resource and implement a 100 m no-go buffer zone around the heritage resource. Where it is determined that the negative impact may not manifest, the heritage resource must be incorporated into an HSMP for implementation. Should ECC have an existing HSMP, BGG-001 must be incorporated into the existing HSMP and be subject to the same requirements encapsulated therein. • Where Project redesign and in situ conservation is not feasible based on the current mining operations and location of the mineral resources, heritage related mitigations must be employed. Heritage related mitigations will need to be undertaken in accordance with the requirements of the NHRA and NHRA Regulation, 2000 (GN R 548) will be required. Such mitigations may include a Burial Grounds and Graves Consultation (BGGC) to assess whether a GRP (which must be undertaken in accordance with Section 36 of the NHRA and Chapter IX and XI of the NHRA Regulations) is feasible. • Digby Wells assumes that Project design is the preferred alternative, and the post-mitigation impact assessment considers this mitigation strategy.	6	1	5	1	Moderate (positive) + (72)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Construction	Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.	2	3	-2	7	Minor (negative) -49	• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • Make use of existing roads to encourage minimal impacts/footprint; • The footprint of the proposed mining operations should be limited to the extent of the infrastructure where possible.	2	2	-2	3	Negligible (negative) -18
Construction	Construction of Infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	3	2	-3	7	Minor (negative) -56	• All buildings and reflective surface must be limited in height and be painted natural hues to limit the extent and intensity of the visual impact. This is particularly relevant to the Discard Wash plant; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after construction or apply dust suppression techniques where applicable;	3	2	-2	6	Moderate (negative) -42
Operational	Blasting (only when dikes and other geological features are encountered).	Soil, Land Use, and Land Capability	• Movement of the soil strata; and • Potential subsistence, causing ponding and undulating topographies	5	3	4	5	Moderate (negative) - 60	• Do not blast in sensitive areas (wetland areas) where there is a possibility of ponding and subsidence; and • Limit the use of blasting.	4	2	2	4	Negligible (negative) - 32
Operational	Underground mining machinery maintenance.	Soil, Land Use, and Land Capability	• Soil Contamination; and • Soil compaction.	5	3	3	6	Minor (negative) - 66	• Soil pollution monitoring should be conducted at selected locations on the project site to detect any extreme levels of pollutants; and • Any spillage effluent should be cleaned up immediately and the removed contaminated soils should be disposed of at accredited disposal sites.	4	2	1	4	Negligible (negative) - 28
Operational	Use of existing haul roads and vehicle movement.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential.	5	4	4	5	Moderate (negative) - 65	• Make use of existing roads to encourage minimal impacts/footprint to the Project Area; • Keep to designated areas for vehicle movement to prevent further compaction and potential erosion; and • Maintain road culverts and monitor soil erosion and sedimentation.	4	2	2	4	Negligible (negative) - 32

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Operational	In-pit ROM Stockpiling.	Soil, Land Use, and Land Capability	• Soil Contamination from ROM stockpiles, leaching, erosion, sedimentation of contaminants; • Loss of vegetation and habitat due to high contaminates in soils; and • Erosion and sedimentation from ROM Stockpiling areas.	5	3	3	6	Moderate (negative) - 66	• Runoff must be controlled and managed by the use of proper stormwater management measures; • Stockpiles should be engineered to prevent excessive runoff and erosion; • Construct a trench around the stockpiles to prevent runoff, contaminants, and sediments to enter the natural systems; and • ROM-stockpiles not to be constructed in high land capability areas and wetland areas.	4	2	3	4	Minor (negative) - 36
Operational	Operation of water and sewer reticulation. Waste management activities.	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); and • Soil contamination from sewage and wastewater	5	3	3	6	Moderate (negative) - 66	• Soil pollution monitoring should be conducted at selected locations on the Project site to detect any extreme levels of pollutants; and • Any spillages of sewage effluent from the treatment plant or ablution facilities should be cleaned up immediately and the removed contaminated soils should be disposed of at accredited disposal sites.	4	2	2	4	Negligible (negative) - 32
Operational	Operation of the coal discard processing plant.	Soil, Land Use, and Land Capability	• Contamination of soil; • Increased runoff; and • Increased erosion and consequently sedimentation potential.	5	4	4	6	Moderate (negative) - 78	• Soil pollution monitoring should be conducted at selected locations on the project site to detect any extreme levels of pollutants; • Discard from the coal wash plant must be contained and treated before released into the environment; and • Any spillages from the coal wash plant should be cleaned up immediately and the removed contaminated soils should be disposed of at accredited disposal sites.	4	2	3	4	Minor (negative) - 36
Operational	Underground blasting and operation of the underground workings.	Fauna and Flora	• Subsidence of areas that have been destabilised by underground workings; • Potential contamination of underground water and air; and • Increased risk of erosion.	6	3	4	4	Minor (negative) -52	• Consider areas with high flood areas and install regulated buffer zones to prevent mine inundation for the underground workings; • Adhere to all management and mitigation measures as prescribed within other specialist reports. • Undertake a subsidence risk assessment study to determine areas of high risk for subsidence and demarcate these areas after mining has taken place	6	2	3	4	Minor (negative) -44

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									to minimise the risk if collapse for faunal species, as well as allow for the search and rescue of SCC flora that may be affected by the subsidence. • Avoidance of underground mining activities where high subsidence probability intersect with high sensitivity (CVB wetland) habitat. • Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment. This will be prudent in this development, since petroleum and other hydrocarbons associated with the trucks and vehicle-based activities are likely to be spilled in the environment if not managed well. Please refer to the Digby Wells Hydropedology Report (2021) for measures regarding this matter.					
Operational	Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas	Fauna and Flora	• Habitat disturbances and increased soil erosion, soil contamination and compaction. • Increased faunal casualties (roadkill); • Increased erosion and sedimentation decreasing vegetation cover; • Dust pollution, and AIP proliferation; • Ensure maintenance of infrastructure to prevent any spillages thus preventing contamination of the soil; • Increased vehicle movement in the area, increasing soil compaction, and runoff potential; and • Unexpected changes in the topography and overall habitats.	5	2	3	4	Minor (negative) -40	• Monitoring of the vegetation communities present must be completed every 2 years to document to impacts of the edge effect and fragmentation; • Adhere to mine health and safety protocol regarding speed limits. Install signage of faunal and floral sensitive areas to prevent unnecessary damage to areas out of the demarcated areas; • Monitoring of alien invasive sprawl during the operation is recommended as the surrounding vegetation is relatively intact and free from alien invasive plants; • Ensure maintenance of infrastructure to prevent any spillages thus preventing contamination of the soil; and • Vegetate stockpiles to prevent soil loss, organic material loss, erosion, and sedimentation.	5	2	3	2	Negligible (negative) -20

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Operational	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	5	3	3	4	Minor (negative) -44	• An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been damaged and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present; • Dust suppression techniques should be implemented on all access and haul roads; • Toolbox talks regarding vehicle speed limits should be regularly implemented; and • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions.	5	2	3	2	Negligible (negative) -20
Operational	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	5	4	4	4	Minor (negative) -52	• All vehicles operating on the site should be regularly checked for hydrocarbon leaks; and • All refuelling and servicing should be undertaken within bunded designated areas to avoid hydrocarbons reaching the surrounding environment.	5	1	2	4	Negligible (negative) -32
Operational	Blasting (only when dikes and other geological features are encountered).	Wetlands	• Movement of the strata causing potential subsistence, resulting in ponding and undulating topographies; and • Dewatering and drying out of wetlands.	7	3	7	7	Major negative (-119)	• Freshwater resource monitoring must be carried out during the operational and decommissioning phases by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; • Actively landscape and re-vegetate disturbed areas as soon as possible to avoid loss of soil, organic material, and sedimentation into wetland areas; and • If it is unavoidable that any of the wetlands be affected, the disturbance must be minimised and suitably rehabilitated.	6	3	6	6	Moderate negative (-90)
Operational	Underground mining machinery maintenance.	Wetlands	• Contamination and deterioration of soil and water quality and quantity; and • Loss or changes to natural wetland PES, ES and EIS.	6	3	6	5	Moderate (negative) – 75	• Re-fuelling and maintenance must take place on a sealed surface area away from wetlands to prevent the ingress of hydrocarbons into topsoil; • All spills must be cleaned up immediately to prevent contaminants to enter the wetlands;					Minor (negative) – 48

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Channelled water should not be dispersed in a concentrated manner. Baffles should be incorporated into artificial drainage lines/channels around the surface infrastructure to decrease the kinetic energy of water as it flows into the natural environment; • A SWMP should already be implemented. This should consider wetlands associated with the new developments/infrastructure which should divert stormwater away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible; • No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas or their buffer areas. All vehicles must remain on demarcated roads and within the operational footprint; and • All vehicles must be regularly inspected for leaks.					
Operational	Use of existing haul roads and vehicle movement.	Wetlands	• Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential into wetlands; • Loss of vegetation and habitat; and • Wetland fragmentation.	6	3	5	5	Minor negative (-65)	• The edge of the wetlands and a 100m buffer or 1:100 flood line buffer should be demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the operational phase; • All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off-limits to all unauthorised vehicles and personnel; • If it is unavoidable that any of the wetland areas present will be affected, the disturbance must be minimised and suitably rehabilitated; • If spill occur, it must be cleaned up immediately and remediated; • No material is to be dumped or stockpiled within any rivers, tributaries or drainage lines; • Culverts, roads and river crossings must be maintained, cleared and monitored; and • No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas	5	2	3	4	Minor (Negative) (-40)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									or their buffer areas. All vehicles must remain on demarcated roads and within the operational footprint.					
Operational	In-pit ROM Stockpiling.	Wetlands	• Potential runoff from topsoil and subsoil stockpiles causing sedimentation into the wetlands; and • Erosion and sedimentation of contaminants into the wetland areas.	6	3	5	4	Minor negative (-56)	• The edge of the wetland and a 100m buffer or 1:100 flood line buffer should be demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the operational phase; • All areas of increased ecological sensitivity should be designated as "No-Go" areas; • No material is to be stockpiled or dumped within any wetlands, 100 m buffer or 500 m buffer zones of the wetlands, nor in rivers, tributaries or drainage lines; • A SWMP should already be implemented. This should consider all wetlands and other watercourses associated with the new developments/infrastructure which should divert stormwater away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible. The SWMP should also convey stormwater to silt traps to limit erosion and the subsequent increase of suspended solids in downstream watercourses; • Freshwater resource monitoring must be carried out during the operational phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; and • Ensure Soil Management and AIPs Plans are implemented and maintained to minimise erosion and sedimentation.	4	2	4	3	Negligible negative (-30)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Operational	Operation of water and sewer reticulation. Waste management activities.	Wetlands	• Contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland integrity and biodiversity.	6	3	6	5	Moderate negative (-75)	• A SWMP should already be implemented. This should consider all wetlands and other watercourses associated with the new developments/infrastructure which should divert stormwater and wastewater away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible. The SWMP should also convey contaminated water to silt traps to limit erosion and the subsequent increase of suspended solids in downstream watercourses; • Clean water must be separated from contaminated/dirty water. Clean water must be put back into the freshwater systems, whereas contaminated water must first be treated; • Freshwater resource monitoring must be carried out during the operational phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; and • Care must be taken to ensure that contamination of the receiving environment as a result of mining activities is minimised as far as possible; • Chemicals, such as paints and hydrocarbons, should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; • All spills should be immediately cleaned up and treated accordingly.	5	2	4	4	Minor negative (-44)
Operational	Operation of the coal discard processing plant.	Wetlands	• Contamination of soil, water and wetlands; • Loss of wetland health and biodiversity; and • Loss of wetland functionality.	6	3	7	6	Moderate negative (-96)	• Freshwater resource monitoring must be carried out during the operational phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; • Care must be taken to ensure that contamination of the receiving environment as a	5	3	5	5	Minor negative (-65)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									result of mining activities is minimised as far as possible; and • Spillage from the coal processing plant must be cleaned up immediately to prevent pollutants entering the freshwater systems.					
Operational	Uncontrolled runoff of stormwater or process water from or through the surface infrastructure	Aquatics	• Water quality and habitat deterioration of watercourses receiving unnatural/contaminated runoff.	5	3	-5	5	Minor (negative) – 65	The following management actions are recommended to guide the effective management of stormwater and water generated on site: • Runoff from dirty areas should be directed to the storm water management infrastructure (drains and PCDs) and should not be allowed to flow into the nearby watercourses, unless DWS discharge authorisation and compliance with relevant discharge standards as stipulated in the NWA is obtained; • Channelled water should not be dispersed in a concentrated manner. Baffles should be incorporated into artificial drainage lines/channels around the surface infrastructure to decrease the kinetic energy of water as it flows into the natural environment; • Bare surfaces downstream from the developments where silt traps are not an option should be vegetated in order to attempt to limit erosion and runoff that might be carrying contaminants; • Careful monitoring of the areas where dust suppression is proposed should be undertaken regularly. Areas concentrating water runoff should be addressed and not allowed to flow freely into associated watercourses; and • Monitoring of the associated water courses should be done by an aquatic specialist in order to determine potential impacts where after new mitigation actions should be implemented as per the specialist's recommendations.	5	1	-1	3	Negligible (negative) – 21
Operational	Runoff from the dirty water areas or catchments (coal stockpile areas, mine processing plant, workshops etc.).	Hydropedology	• Surface water contamination and deterioration of water quality on the natural water resources.	3	5	4	5	Moderate (negative) - 60	The following mitigation measures are recommended: • The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by	2	2	2	2	Negligible (negative) - 18

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Operational	Hydrocarbons and chemicals spillages and leakages from equipment, moving haulage trucks and machinery.	Hydropedology	• Water contamination by hydrocarbon waste and deterioration of water quality through runoff and potential groundwater contamination where leaks and spillages occur within recharge soils.	5	4	3	6	Minor (negative) - 72	approved contractors for disposal to appropriate disposal sites; • The overall housekeeping and storm water system management (including the maintenance of berms, de-silting of dams and conveyance channels and clean-up of leaks) must be maintained throughout the LoM; • The hydrocarbon and chemical storage areas and facilities must be located on hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances; • Training of mine personnel and contractors in proper hydrocarbon and chemical waste handling procedures is recommended; and • Vehicles must only be serviced within designated service bays.	5	2	2	2	Negligible (negative) - 18
Operational	Hydrocarbon and chemical spillages and leakages from equipment, moving vehicles and machinery during mining, processing, loading and hauling of the product coal.	Surface water	• Surface water contamination by hydrocarbon waste and deterioration of surface water quality	5	4	3	4	Minor (negative) - 48	• The mitigation measures described below are currently being undertaken on the existing DCM operations and these should continue to ensure as low impacts on water resources as practically possible. • Ensure that runoff from dirty areas is being directed to the existing storm water management infrastructure and should not be allowed to flow into the watercourses, unless DWS discharge authorisation has been granted upon compliance with relevant effluent discharge standards as stipulated in the National Water Act (NWA); • Water quality monitoring should continue downstream and upstream of the mine site, and within all surface water circuits at the mine to detect any contamination arising from operational activities; • The hydrocarbon and chemical storage areas should continue to be located on hard-standing areas (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This helps to prevent mobilisation of leaked hazardous substances;	5	2	2	3	Negligible (negative) - 27
Operational	Runoff from contaminated areas such as Waste Rock Dumps (WRDs), STP and discard processing plant may pollute nearby surface water resources.	Surface water	• Surface water contamination by runoff from dirty areas and deterioration of surface water quality.	6	4	4	5	Minor (negative) - 70		4	2	2	4	Negligible (negative) - 32

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Mine workers should be trained in the use of spill kits to contain and immediately clean up any leakages or spills and inductions should be conducted for new employees. • Servicing of vehicles and machinery should continue being conducted at designated, appropriately paved areas. All used oils should be disposed of by accredited vendors from the mine site; and • Disposal of general and other forms of waste should continue to be done into clearly marked skip bins which are collected by approved contractors for final disposal to appropriate disposal sites.					
Operational	Active mine dewatering will be required to ensure dry working conditions in the open pits and underground mining areas. The dewatering will cause ground levels to be drawn down in the vicinity of the mining area.	Groundwater	• Mine dewatering causing lowering of groundwater levels	6	2	3	6	Minor (negative) - 42	• Mining should progress as swiftly as possible to reduce the period of active dewatering; • The mining area extent should be kept to a minimum; • Dewatering of the open pits and underground voids should stop should as soon as the mining activities cease; and • Groundwater levels surrounding the pits and voids should be monitored on a regular basis throughout the LoM to verify the extent of the cone of drawdown.	5	2	3	6	Minor (negative) - 39
Operational	Mine dewatering causing a decrease in groundwater reserves	Groundwater	• Due to active mine dewatering required to ensure dry working conditions in the open pits and underground voids, certain groundwater volumes will be extracted from the open pits and underground mining areas, limiting the groundwater resource.	6	2	3	4	Minor (negative) - 36	• Mining should progress as swiftly as possible to reduce the period of active dewatering; • The mining area extent should be kept to a minimum; • Dewatering of the open pits and underground voids should stop should as soon as the mining activities cease; and • Dewatering volumes should be monitored frequently throughout the LoM to note deviations from the predicted inflows as soon as possible.	5	2	3	4	Negligible (negative) - 33
Operational	AMD formation in pits, underground voids and co-disposal facility; other surface sources that could cause groundwater contamination.	Groundwater	• Due to AMD formation in the mining areas and co-disposal facility, or any seepage from infrastructures, the groundwater quality could be impacted upon.	6	2	2	3	Negligible (negative) - 22	• Groundwater abstraction should continue for the LoM to maintain a cone of drawdown; • Monitoring of groundwater quality in the area surrounding the mining areas should continue throughout the LoM;	5	2	2	2	Negligible (negative) - 18

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Groundwater levels surrounding the mining areas should be monitored on a regular basis throughout the LoM to verify the extent of the cone of drawdown; • Dispose of coal discard slurry at the co-disposal facility only; • Pollution control dams and/or ROM coal stockpile areas should be lined, and clean water needs to be diverted away from these infrastructures; and • Contamination from workshops, sewage treatment plant, wash bay or waste collection areas should be contained as much as possible by proper construction of hardstanding and bunded areas.					
Operational	Establishment of Open Underground Mine, Ventilation Shaft, In-pit Stockpiling and Operation of the Discard Plant.	Air Quality	• Dust generation and reduction in ambient air quality.	5	3	5	6	Major (negative) – 78	• Application dust suppressant on the haul roads and exposed areas; • Limit activity to non-windy days (wind speed less than 5.4 m/s); • Set maximum speed limits on haul roads and have these limits enforced; • The drop heights when loading onto trucks and at tipping points should be minimised; • The enclosure of the screening and crushing circuit; and • Dust mitigation equipment for the dryer exhaust.	5	2	2	4	Negligible (negative) – 36
Operational	Mining of coal by underground mining	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.	5	2	2	3	Negligible (negative) – 27	The following management measures are recommended as good practice guidelines. • Machinery and vehicles used for maintenance work should be switched off when not in use; • Maintenance of existing berms on site; • Machinery and vehicles used for mining should be switched off when not in use; • Vehicles on site, should have white noise reversing alarm (buzzer type reverse alarms) installed, rather than the conventional beeping type reverse alarms; • Vehicles to be serviced as per their design requirements to ensure noise suppression	5	2	1	3	Negligible (negative) – 24
Operational	Blasting (only when dikes and other geological features are encountered)	Noise												
Operational	In-pit ROM Stockpiling	Noise	• Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.											
Operational	Diesel storage and explosive magazine	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.											

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Operational	Underground Mining Machinery Maintenance	Noise	Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.						mechanisms are effective e.g. installed exhaust mufflers; and • Regulate vehicle speeds on the access and haul roads.					
Operational	Operation of water and sewer reticulation	Noise												
Operational	Use of existing haul roads	Noise												
Operational	Long term employment creation	Socio-economic	• Extended employment periods at the mine through the extension of the LoM.	4	3	2	4	Minor - positive (36)	• Revise the DECM's Employment Policy where necessary with the objective of increasing local employment and transferring operational positions from migrant workers to people from within the study areas. • In the event of new positions being created or vacant posts being filled, local labour should be prioritised in the recruitment process as part of the DECM's employment policy or as part of a contractor management plan with the objective of recruiting 100% of any new or additional unskilled labour from local communities. • Develop a database of goods and services that could potentially be outsourced to the local community. • Implement a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operation is met. The targets should be aligned to the Mining Charter 2018. • Ensure that the grievance mechanism is widely known and accessible to allow communities the opportunity to register complaints and have these addressed in a timeous manner.	4	4	3	5	Minor - positive (55)
Operational	Project-induced in-migration	Socio-economic	• An increase in certain segments of the population can place additional strain on housing and services.	4	3	-3	4	Minor – negative (-40)	• Discourage in-migration from other areas by focusing employment opportunities at the local community and widely publicising this intent. • Communicate the mine's intent of utilising the existing workforce at the mine expansion rather than employing additional people. • Any new job opportunities should be offered only to those job seekers who have registered on the mine's database during the construction phase.	3	3	-2	3	Negligible – negative (-24)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Engage with local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues related to in-migration.					
Operational	Skills training	Socio-economic	• As per the requirements of the SLP, the workforce and some of the local community will be upskilled in line with the mine's skills development plan.	5	3	2	7	Minor - positive (70)	• Revise current SLP for the next 5-year cycle between 2022-2027 and include additional skills training programmes to ensure required skills are in place to support redeployment of workforce. • Identify skills deficiencies against requirements, performance management, succession planning, career structuring and operational equity plan and include appropriate training programmes in the new SLP cycle. Ensure that these aligned to the core skills areas of the mine and hard to fill vacancies. • Give preference to students for local communities for bursaries and internships. Advertise these in the local media.	5	3	3	7	Moderate - positive (77)
Operational	Social investment in local communities	Socio-economic	• The mine is currently implementing mine community development projects and will continue to do so under this project that extends the LoM and the mine's SLP commitments.	5	5	3	4	Minor - positive (52)	• Revise and update SLP for next 5-year cycle to include updated mine community development projects. • Ensure mine community development projects are in line with identified projects in the IDP and decided on in consultation with relevant stakeholders (municipality, communities, etc). • Develop an updated mine community plan as part of an updated SLP for the project in consultation with relevant local stakeholders. • Ensure that the current allocation as per DECM's Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter 2018. • Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to the contractors and direct service providers).	5	5	4	5	Minor - positive (70)
Operational	Multiplier effects on the local and regional economy	Socio-economic	• Through the expansion of the DEMC, direct and multiplier effects will continue for a further 14 years.	5	4	2	4	Minor - positive (44)	• Implement enhancement measures linked to employment creation and opportunities associated with the supply chain. • Implement SLP related interventions.	5	5	6	6	Moderate - positive (96)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Compliance with SLP commitments to make maximum use of local SMMEs and BBBEE companies. • Implement grievance procedure.					
Operational	Continuation in nuisance factors	Socio-economic	• The extended LoM implies an extension and intensification of certain nuisance factors such as blasting, resulting in continued noise and dust pollution and other issues.	5	3	-3	5	Minor - negative (-55)	• Implement mitigation measures as per the Noise and Air Quality Impact Assessment specialist studies. • Alert surrounding communities if activities are going to take place that will increase dust and noise levels and proposed additional mitigation measures that will be implemented during this time. • Communicate the mine's grievance mechanism and how to access the system through the local media. Ensure that users know how to access the system and address grievances timeously.	5	2	-2	5	Minor - negative (-45)
Operational	Continued competition over water resources	Socio-economic	• Water is a scarce resource, and the expansion of the mine could further impact on this limited resource.	5	5	-5	4	Minor - negative (-60)	• Implement mitigation measures under the EMPr to prevent contamination of shared water resources; and • Communicate the mine's grievance management system to local communities and respond timeously to any grievances related to water resources.	5	3	-3	3	Negligible - negative (-33)
Operational	Community health, safety, and security	Socio-economic	• Continuation and expansion of mining activities will lead to a possible increase and continuation of impacts associated with community health, safety, and security.	6	2	-5	5	Minor - negative (-65)	**General:** • In partnership with government authorities the Project to support improvements to existing health services to handle the increase in population numbers and changes to the existing health profile of the area. This may include facilities, quality of medical personnel, diagnostic capacity, and treatment, etc. **Develop and implement an Emergency Prevention, Preparedness and Response Plan:** • Design and implement measures to minimise the risk of hazardous substances entering the environment, including development of an Emergency Prevention, Preparedness and Response Plan for accidents involving release of hazardous substances to the environment. This will include: • Installation of oil water separators and grease traps as appropriate at fixed refuelling facilities,	6	2	-2	3	Negligible - negative (-30)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									workshops, parking areas, fuel storage and containment areas. • Use of drip trays and other temporary measures to prevent entry of hazardous substances into the environment during fuelling or servicing of vehicles and equipment on site. • Provision of spill kits and training of staff in their use. • Secure storage and labelling of hazardous substances in line with the manufacturer's recommendations and measures to prevent contact with untrained personnel, birds, animals. • Secondary containment using impervious, chemically resistant material and designed to prevent contact between incompatible materials in the event of a release. **To mitigate the risk of increased transmission of communicable diseases:** • Develop information, education and communication campaigns around diseases and health practices including communicable diseases such as HIV/AIDS, TB, and Covid-19. • Regularly review and update as necessary its existing communicable diseases management strategy. **To mitigate the potential for diseases associated with access to water and sanitation facilities:** • Survey all households in the primary study area to record the location, extent, and quality of water sources the size of the population reliant on water and its usage patterns, particularly regarding seasonality, and differences in water use or access by vulnerable populations, including women. • Develop a programme in consultation with local communities to improve access to decent quality potable water and determine preferred water infrastructure. **To mitigate community safety from road traffic:**					

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• Develop a Traffic Management Plan covering vehicle safety, driver, and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and accident reporting and investigations. • Strictly enforce drug and alcohol policies in relation to Project drivers and undertake regular and random testing of drivers and in response to suspicious behaviour. • Require Project drivers to be trained in defensive driving and provided regular refresher courses. • Propose road bypasses where there is a significant risk to public safety from road accidents. • Establish preparedness and response capabilities to deal with any road traffic or other accidents that may occur including multiple casualty events. • In partnership with local authorities and the police, educate communities on road traffic laws and road safety.					
Operational	Operation of surface infrastructure (discard wash plant, workshop area, and related infrastructure)	Visual	• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.	6	3	-3	7	Moderate (negative) -84	• As far as possible, preserve the natural vegetation to reduce the visual impact; • Sensitive receptors should be mitigated from the visual impact by a strategic usage of tree-lines and on site berm features which integrate with effective landform design and • Buildings associated with the Discard Wash Plant, Workshop area and related infrastructure should be kept to a colour that does not bear a large contrast to the existing natural vegetation and landscape	5	2	3	6	Minor (negative) -60
Operational	Lighting of mine infrastructure at night	Visual	• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.	4	2	-2	4	Negligible (negative) - 32	• Focus the lights towards components of the mine that require specific lighting to avoid light dispersal; and • Consider utilizing lower lumen lighting that does now spill outside of the mine region.	4	1	2	4	Slightly Detrimental -24
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and	Soil, Land Use, and Land Capability	• Compaction of soil; • Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology; and	3	3	4	5	Minor (negative) - 50	• Continue with Concurrent Rehabilitation and implement land rehabilitation measures;	4	2	2	4	Negligible (negative) - 32

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
	topsoil, profiling of the land, and re-vegetation.		• The proliferation of AIPs, changing the soil biodiversity, and potential.						• Address compacted areas by deep ripping to loosen the soil and revegetate the area as soon as possible; • Re-vegetate exposed soil areas to promote organic carbon and soil health; • Ensure proper stormwater management designs are in place to ensure no run-off or pooling occurs; • Only designated access routes are to be used to reduce any unnecessary compaction; and • The backfilled, reprofiled landscape should be top soiled and revegetated to allow free drainage close to the pre-mining conditions.					
Closure	Demolition of infrastructure and rehabilitation of affected areas.	Soil, Land Use, and Land Capability	• Disturbance of soils and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; and • Ponding of water and creation of drainage channels.	6	3	4	5	Minor (negative) - 65	• Continue with Concurrent Rehabilitation and implement land rehabilitation measures; • Address compacted areas by deep ripping to loosen the soil and revegetate the area as soon as possible; • Inventory of hazardous waste materials stored on-site should be compiled and arrange complete removal; • Monitor decant of Acid Mine Drainage (AMD) and implement management measures which include in-situ passive treatment or neutralisation and electrolytic treatment using a WTP to get purified water for discharge to the natural environment or other beneficial uses; • Seal the shaft by placing concrete plugs as well as implement a monitoring plan to ensure no decant; • Ensure proper stormwater management designs are in place to ensure no run-off or pooling occurs; • Only designated access routes are to be used to reduce any unnecessary compaction; and	2	2	2	4	Negligible (negative) - 24

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
									• The backfilled, reprofiled landscape should be top soiled and revegetated to allow free drainage close to the pre-mining conditions.					
Closure	Post-closure monitoring and rehabilitation.	Soil, Land Use, and Land Capability	• Minimal negative impacts on the environment; • AIPs Monitoring Plan; and • Soil compaction and increased runoff potential due to vehicle movement during rehabilitation programs.	5	4	2	5	Minor (negative) - 55	• The backfilled, reprofiled landscape should be top soiled and revegetated to allow free drainage close to the pre-mining conditions; • Continue with Concurrent Rehabilitation and implement land rehabilitation measures; and • Rehabilitation and Monitoring Plan.	6	4	+ 3	7	Moderate (Positive) 91
Closure	Demolition and removal of infrastructure	Fauna and Flora	• Disturbance of soils, and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape.	5	3	3	4	Minor (negative) -44	• Continue with concurrent Rehabilitation, begin with stockpiles, bare grounds and dumps, implement rehabilitation measures; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible to prevent AIP sprawl; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; and • Only designated access routes are to be used to reduce any unnecessary compaction.	2	2	2	4	Negligible(negative) -24
Closure	Post-closure monitoring and rehabilitation	Fauna and Flora	• Minimal negative impacts on the environment; • Activities involve the rehabilitation processes of reprofiling the soils and re-vegetation thereafter; • Impacts include the possibility of erosion and sedimentation; • Proliferation of AIPs; and • Change in the habitat and species composition.	4	1	5	5	Minor (negative) -50	• During the closure phase, rehabilitation must start as soon as possible and preferably in the growing season (October to February) to ensure adequate plant recruitment; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; and • Only designated access routes are to be used to reduce any unnecessary compaction.	6	3	2	6	Positive Impact (positive) 66
Closure	Closure of the underground mine.	Fauna and Flora	• Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats; and • Change in the land topography and species composition.	6	3	5	4	Minor (negative) -56	• Ensure mitigations measures to prevent subsidence are enforced and maintained throughout the closure phase.	4	3	4	3	Negligible -33

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Wetlands	• Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology of the wetlands; and • The proliferation of AIPs. • Exposure of soils and subsequent compaction, erosion, and sedimentation into the wetlands; • Deterioration of water quality; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of wetlands.	5	3	5	6	Minor negative (-78)	• Decommissioning should occur in the dry season to avoid high rainfall events that could lead to increased runoff, erosion, contamination and sedimentation of the wetlands; • Stormwater must be diverted from decommissioning activities; • Stored mine-affected water should be treated before decommissioning of any mine-related water retention areas, such as PCDs and wastewater facilities; • Actively landscape and re-vegetate disturbed areas as soon as possible to avoid loss of soil, organic material, and sedimentation into wetland areas; • Implement and maintain a Wetland and AIPs Plan for the duration of the decommissioning phase and into closure; • No material should be dumped/stockpiled within any wetlands or watercourses; • No vehicles or heavy machinery should be allowed to drive indiscriminately within any wetland areas or their buffer areas. All vehicles must remain on demarcated roads; and • Monitor the decant of AMD and implement management measures which include for example an abstraction borehole placed down gradient of the decant point and in-situ passive treatment or neutralisation and electrolytic treatment using a WTP to get purified water for discharge to the natural environment or other beneficial uses (refer to Groundwater Impact Assessment, (Digby Wells, 2021).	4	2	3	4	Minor negative (-36)
Closure	Post-closure monitoring and rehabilitation.	Wetlands	• Onset of erosion and sedimentation; and • AIPs proliferation.	3	2	3	4	Negligible negative (-32)	• An AIPs Management Plan must be in place during the decommissioning phase. In this regard, special mention is made of *A. mearnsii, Eucalyptus grandis and Pinus patula* which is the dominant alien invasive tree species observed adjacent to the HGM units at the time of the assessment;	2	1	2	2	Negligible negative (-10)
Closure	Post-mining decants into wetlands and streams	Wetlands	• Water, soil and wetland contamination; • Decreased PES, ES and EIS; and	7	4	6	7	Major negative – 119		6	4	5	7	Moderate negative (–105)

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
			• Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use.						• No vehicles or heavy machinery should be allowed to drive indiscriminately within any wetland areas or their buffer areas. All vehicles must remain on demarcated roads; • All vehicles must be regularly inspected for leaks; • Re-fuelling must take place on a sealed surface area away from wetlands to prevent the ingress of hydrocarbons into the topsoil; • All spills should be immediately cleaned up and treated accordingly; • Appropriate sanitary facilities must be provided for the duration of the decommissioning phase and all waste must be removed to an appropriate waste facility; and • Wetland monitoring must be carried out during the decommissioning phase into mine closure to ensure no unnecessary impact to wetlands takes place.					
Closure	Seepage and runoff of contaminated water entering aquatic ecosystems.	Aquatics	• Water quality deterioration of watercourses in contact with contaminated water resulting in AMD.	7	5	-6	6	Minor (negative) – 108	The goal of mitigation should be to prevent and or limit the seepage and runoff of contaminated water into associated aquatic ecosystems. The following measures may be utilised in attempt to reduce the Post Closure impacts: • Best practise rehabilitation should be utilised to trap and contain the deep sediments that contain the acid forming rock responsible for acid water formation. • If decant occurs post-closure, passive treatment with lime or other alkaline compounds can be applied to neutralise AMD at the decant points. Aquatic biomonitoring is also recommended to monitor any changes in the aquatic ecosystems and to provide solutions for identified, additional/unforeseen impacts for at least three years after rehabilitation.	3	1	-1	3	Negligible (negative) – 15
Closure	Demolition of mine infrastructure (PCDs, workshops, haul roads, processing plant etc.)	Hydropedology	• Sedimentation and siltation of nearby watercourses and deterioration of water quality.	5	4	3	7	Moderate (negative) - 84	The following mitigation measures are recommended: • Restore the topography to pre-mining conditions as much as is practically possible by backfilling,	5	2	2	2	Negligible (negative) - 18

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
	Disturbance of soils and erosion by overland flow.								removing stockpiles and restore the slope gradient and angle of the site;					
Closure	Rehabilitation of disturbed sites close to pre-mining conditions.	Hydropedology	• Restoration of pre-mining streamflow regime in nearby watercourses.	7	5	3	6	Moderate (positive) -90	• Immediate revegetation of cleared areas; • Where practical, closure activities should be prioritized during dry months of the year (May to September);	No mitigation possible.				
Closure	Potential risk of subsidence.	Hydropedology	• The mined-out areas may be prone to subsidence.	7	5	4	6	Moderate (negative) - 96	• Movement of demolition machinery and vehicles should be restricted to designated access roads to minimise the extent of soil disturbance; • Use of accredited contractors for removal or demolition of infrastructure during closure is recommended; this will reduce the risk of waste generation and accidental spillages; • Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before closure; • Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site; • If decant occurs post-closure, passive treatment with lime or other alkaline compounds can be applied to neutralise AMD at the decant points; • If decant occurs, the decant needs to be captured, contained and treated to acceptable or prescribed water quality standards prior to discharge into the natural water resources; • Avoid ground destabilisation of areas regarded as important for wetland recharge; and • Removal of pillars post closure should be done in a manner to minimize the risk of subsidence.	6	2	2	4	Minor (negative) - 40
Closure	Disturbance of soils during removal of infrastructure at closure	Surface water	• In-stream water quality and quantity deterioration from sedimentation and siltation.	6	4	2	5	Minor (negative) - 60	The following mitigation measures are recommended: • Disturbance of soils during infrastructure demolition should be restricted to relevant footprint areas;	2	2	2	4	Negligible (negative) 24
Closure	Spillages of hydrocarbons (oils, fuels and grease) by vehicles and machinery used during demolition and transportation of	Surface water	• Surface water contamination due to hydrocarbon waste spillages.	7	5	4	6	Moderate (negative) - 96	• Movement of machinery and vehicles during infrastructure demolition should be restricted to designated access roads to minimise the extent of soil disturbance;	6	2	2	4	Minor (negative) - 40

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
	material from decommissioned infrastructure								• Use of accredited contractors for removal or demolition of infrastructure during closure is recommended; this will reduce the risk of waste generation and accidental spillages					
Closure	Reaction of sulphide compounds in extracted coal residues with water and oxygen, causing Acid Mine Drainage (AMD) and decant to low-lying areas.	Surface water	• Contamination of soil and water resources from potential decant of AMD and movement of contamination plumes due to the re-watering of the backfilled pit.	7	5	4	6	Moderate (negative) - 96	• Re-profiling and revegetation of disturbed landscapes post-closure should be conducted to facilitate free drainage as much as practically possible to support post-mining land use; and • If decant occurs post-closure, passive treatment with lime or other alkaline compounds can be applied to neutralise AMD at the decant points. • Should passive treatment fall short, active or electrolytic water treatment (e.g., Reverse Osmosis) should be considered.	6	2	2	4	Minor (negative) - 40
Closure	Mine Dewatering and residual effect on rebounding groundwater levels.	Groundwater	• Due to the dewatering activities during the operational phase, groundwater levels surrounding the mining areas will be subdued at the start of the Post Closure Phase, after it will gradually recover towards pre-mining levels.	6	2	3	6	Minor (negative) -42	• Dewatering should cease as soon as possible after mining activities are completed to allow for groundwater level recovery; • Groundwater level recovery should be frequently monitored to identify deviations from the predicted recovery rate Groundwater quality should be frequently sampled to establish if a contaminant plume will migrate ; and • Clean water and runoff should be diverted where possible towards the open pit voids to flood areas as fast as possible after mining has stopped.	5	2	3	6	Minor (negative) - 39
Closure	AMD formation in open pits, underground voids and co-disposal facility.	Groundwater	• Due to AMD taking place within the backfilled open pits and in co-disposal facility, groundwater contamination with elevated sulphate and low pH could occur.	7	2	6	6	Moderate (negative) - 90	• Dewatering of the pits should cease as soon as possible after mining activities are completed to allow for groundwater level recovery; • Rehabilitation of the pits and co-disposal facility to reduce infiltration of rainwater into the dump to reduce seepage generation; • Clean water and runoff should be diverted where possible towards the rehabilitated pits as fast as possible after mining has stopped; • Groundwater quality should be frequently sampled to establish if a contaminant plume will migrate; and • If a contaminant plume is detected from Pit 1 or Pit 2, groundwater may need to be abstracted and treated before release into the environment.	7	2	4	6	Minor (negative) - 60

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
Closure	Mine decant causing contamination of groundwater.	Groundwater	• If groundwater levels within the open pits recover to elevations higher than surface elevations, this water may then flow from the pit areas and cause groundwater contamination down gradient of the mine.	7	2	6	5	Moderate (negative) - 84	• The post-closure sealing of inter-connections between the mining areas at DECM, especially between the underground mine voids and the opencast pits; • Installation of groundwater abstraction boreholes at decant points, or formation of a pit lake, to reduce water level and prevent decant flow, and treatment of the abstracted water; • Rehabilitation of the pits and co-disposal facility to reduce infiltration of rainwater into the dump to reduce seepage generation; and • Groundwater level recovery in the rehabilitated open pits should be frequently monitored to create stage curves and predict the final water recovery level.	6	2	3	5	Minor (negative) - 42
Closure	Demolition and Removal of Infrastructure and Rehabilitation.	Air Quality	• Dust generation and reduction in ambient air quality.	3	2	2	6	Major (negative) – 42	• Application dust suppressant on the haul roads and exposed areas; • Limit activity to non-windy days (wind speed less than 5.4 m/s); • Set maximum speed limits on haul roads and have these limits enforced; • The area of disturbance must be kept to a minimum at all times and no unnecessary clearing, digging or scraping must occur, especially on windy days; • The drop heights when loading onto trucks and at tipping points should be minimised; and • Rehabilitation of disturbed land to allow for vegetation growth.	3	1	1	4	Negligible (negative) – 20
Closure	Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation.	Noise	• The demolition equipment/machinery will generate noise leading to an increase in noise levels onsite and at sensitive receivers; and • However, the removal of noise generating sources will lead to a reduction in the noise levels.	2	2	2	3	Negligible (negative) – 18	The following management measures are recommendations as good practice guidelines: • Restrict closure activities to daylight hours; • Vehicles on site should have should have white noise reversing alarms (buzzer type reverse alarms) installed, rather than the conventional beeping type reverse alarms; • Regularly service machines and vehicles to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers; • Regulate speed limits on access roads; and	2	1	1	3	Negligible (negative) – 12
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the	Noise	• Noise impacts are considered to be negligible therefore will not be assessed further.											

Phase	Project Activity	Aspect	Impacts	D	E	I	P	Significance (Pre-Mitigation)	Mitigation Measures	D	E	I	P	Significance (Post Mitigation)
	preserved subsoil and topsoil, profiling of the land, and re-vegetation.								• Switch off equipment when not in use.					
Closure	Post-closure monitoring and rehabilitation.	Noise												
Closure	Post-closure monitoring and rehabilitation.	Socio-economic	• Economic Contraction	5	4	-6	6	Moderate - negative (-90)	• Develop and implement an integrated Mine Closure Plan. • Proactively assess and manage the social and economic impacts on individuals, regions, and economies where retrenchment and/or closure of the Project are certain.	3	4	-3	6	Minor - negative (-60)
Post Closure	Seepage and runoff of contaminated water entering aquatic ecosystems	Aquatics	• Water quality deterioration of watercourses in contact with contaminated water resulting in AMD	7	5	-6	6	Minor (negative) – 108	The goal of mitigation should be to prevent and or limit the seepage and runoff of contaminated water into associated aquatic ecosystems. The following measures may be utilised in attempt to reduce the Post Closure impacts: • Best practise rehabilitation should be utilised to trap and contain the deep sediments that contain the acid forming rock responsible for acid water formation; • Financial provision is made annually for a Reverse Osmosis Water Treatment Plant post-closure to prevent AMD water from decanting to release the treated water into the clean environment Aquatic biomonitoring is also recommended to monitor any changes in the aquatic ecosystems and to provide solutions for identified, additional/unforeseen impacts for at least three years after rehabilitation.	3	1	-1	3	Negligible (negative) – 15

13.2 Cumulative Impacts

The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation. The cumulative impacts considered by the relevant specialists are discussed per environmental aspect, below.

13.2.1 Soil, Land Use and Land Capability

Cumulative impacts on soil resources were viewed in the light of similar mining or related operations within the catchment that contribute similar or related pollutants to soil resources within or downstream of the Project area.

Mining and associated activities impacting the soil resources include changes to the Physico-chemical properties of the soil. Impacts include:

- Geomorphological changes to the natural soils and landscape;
- Loss of habitat, vegetation and growth medium;
- Loss of wetland soils, wetlands, groundwater and water resources (boreholes, dams);
- Erosion, destruction of agricultural land, loss of topsoil and organic material;
- Sedimentation and pollution of watercourses (wetlands); and
- Soil contamination through acid and sulphate, stockpiles sediment and erosion, mine impacted water (decant water), and heavy metals.

The cumulative impacts may, therefore, have a significant effect on the soil resources and therefore impacting the land use and land capability of the Project area. Contaminated soil will directly impact the water quality and quantity as well as vegetation of the area.

13.2.2 Fauna and Flora

It is necessary to consider the impacts that the future development will have from a wide-ranging perspective, by considering land-use and transformation of the natural habitat in surrounding areas. Cumulative impacts are assessed by considering past, present and anticipated changes to the biodiversity. Roads, other mining activity and agricultural activity in the area contribute to this regard. The proposed project is localised in extent but could affect The Project Area resides in the Endangered Eastern Highveld Grassland vegetation type which is currently poorly protected. The cumulative loss of the vegetation type as well as the SCC within it should be considered proactively. The primary impacts will include fragmentation and edge effects, isolating pockets of vegetation decreasing movement and corridors for wildlife and threatened species.

Secondary cumulative impacts will include increased accessibility to the site and the resulting increase in development and resource dependence. Ideally, a strategic environmental plan for the area should be developed and adhered to. This should include the conservation of important areas as well as the provision of corridors for faunal movement.

13.2.3 Wetlands

The current impacts on the project area were related largely to agropastoral activities within the Project area as well as mining activities adjacent to the Project Area. In addition to this were the linear infrastructures observed throughout the Project Area such as roads, dams, powerlines, and fences. The impacts can be described as:

- Agropastoral activities (commercial cultivation and cattle grazing) and the spread and proliferation of AIPs had resulted in impacts to the health and integrity of large portions of the wetlands present, which in turn had resulted in channelization and narrowing of the wetland areas within the proposed Project area;
- Mining activities have the potential to result in a significant overall land use change and with this, the loss of SCC habitats important for the maintenance of biodiversity, loss of catchment yields, and decreases in water quality, the latter being of special concern as the freshwater resources downstream of the Project area. Many wetlands and the direct catchment of some wetlands have already been mined, partially mined or fragmented due to mining activities in the Project area;
- The influx of people to the area as a result of mining activities have the potential to result in further impacts related to subsistence farming activities, informal settlements, and additional linear infrastructures. This may result in further degradation of the wetland systems and reflect greater modification of scores as indicated by the determined PES; and
- Impacts related to fragmentation, the creation of preferential flow paths, and compaction of soils due to the presence of existing roads and infrastructure had resulted in the loss of habitat, ecological activity, water retention, and erosion.

The cumulative impacts may therefore have a significant effect on the wetlands and associated catchments. Wetlands and the biodiversity thereof are both highly diverse and of great regional importance to local livelihoods as these valuable natural resources provide a broad array of goods and services to the communities. However, these freshwater systems are under threat and even small impacts may result in total loss of the wetlands.

13.2.4 Aquatic Ecology

Presently, the main cumulative impact identified for the aquatic ecosystems within the project area appears to be the influence of mining and farming areas. Associated activities potentially impact on the biotic and abiotic environment through seepage and runoff, which contaminate the watercourses and result in modified water quality.

13.2.5 Hydropedology

Surrounding land uses in proximity to the DECM include commercial cultivation and cattle grazing which have contributed to the degradation of the present wetlands within the project area. Additionally, the existing mining activities have also contributed to land use change, resulting in the loss of the valuable ecological functions provided by the wetlands within the study area.

The proposed extension of the underground mining is, however, not expected to significantly increase impacts on the hydropedology of the DECM project area. This is because the proposed surface infrastructure will be placed on already disturbed areas and mining extension will be conducted underground, as mentioned. Cumulative impacts will, therefore, be negligible on the nearby water resources especially with the implementation of proposed mitigation measures.

13.2.6 Air Quality

Historical dustfall records for the proposed project area are available for sensitive receptor sites DDES-6 (non-residential), DDES-12 (residential), DDES-13 (residential), and DDES14 (residential) were used to evaluate cumulative impacts. The averages over the twelve months at DDES-6 (1135 mg/m^2/d), DDES-12 (292 mg/m^2/d), DDES-13 (372 mg/m^2/d) and DDES-14 (432 mg/m^2/d) were taken as the background to which the model predicted GLC for the same locations were added (model prediction + the background). The final cumulative values were then compared with the standards for compliance. The final cumulative levels were higher than the limit value for the non-residential receptor at DDES-6 **(1971** mg/m^2/d), and in exceedance at the residential sites DDES-13 **(729** mg/m^2/d) and DDES-14 (**899** mg/m^2/d), as depicted in Table 13-3.

Table 13-3: Comparison of Modelled to Baseline Data

Pollutants	Averaging Period	Location	Regulatory Limit	Dust Deposition Rates (mg/m^2/d)		
				Model	Background	Total
Dustfall	Monthly	DDES-6	1200 mg/m^2/d (Res. Limit)	837	1135	**1971**
		DDES-12	600 mg/m^2/d (Res. Limit)	299	139	438
		DDES-13		372	357	**729**
		DDES-14		436	463	**899**

13.2.7 Noise

The findings of this noise survey show that the predicted emissions will have negligible impacts on the ambient noise levels in the area. This is corroborated by the calculated cumulative noise impacts, which shows that exceedance of the regulatory limit values for both daytime and night-time will not occur at sensitive receivers. Irrespective of the above mentioned, it is recommended that quarterly noise monitoring be conducted to ensure the cumulative impact stay the same for the LoM.

13.2.8 Heritage

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

This Project in conjunction with other planned developments in line with the strategic development plans for the Mpumalanga Province requires consideration to identify the possible in-combination effects of various impacts to known heritage resources. Table 13-4 presents a summary of the possible cumulative impacts of the Project.

Table 13-4: Summary of Potential Cumulative Impacts

Type	Cumulative Impact	Direction of Impact	Extent of Impact
Additive	The proposed construction and operation of the Project will add to the existing infrastructure associated with the local and broader study areas. This Project will contribute to the loss of heritage resources and the gradual sanitising of the cultural heritage landscape. The Project will subtract from the sense of place and will decrease the area in which heritage resources not identified can occur.	Negative	Local study area

13.2.9 Groundwater

The main impacts of opencast mining of coal are groundwater resource reduction, drawdown, and contamination. In addition, a risk of decant exists when water levels in the opencasts recover to above the lowest topographical elevation. Other opencast coal mine operations are present within the wider area surrounding the DECM site. These operations are so close they have the potential to impact on groundwater reserves and levels in the areas situated in between the proposed activities, and it may be these areas will be impacted by multiple mining operations.

As such it is expected that groundwater resources and drawdown, and therefore potentially other groundwater users, in the north and west of the Project area may be impacted upon by at least three mines if simultaneous operation of the mining activities occurs. However, based on the limited extent of the drawdown cone at DÉCM this cumulative effect may be limited.

Contamination from opencast areas, waste rock dumps and other unlined facilities may also cause a cumulative effect on groundwater quality in areas in between the mining operations, but also may accumulate on down gradient surface water features, if contaminated groundwater increases the salt loads the local streams which then feed into regional rivers, such as the Olifants River. In the post-closure phase there is a possibility of these contaminant plumes to contribute salt loads to local drainage features and thus impact upon groundwater down gradient of the mines and surface water downstream of the mining operations. This would impact on other groundwater users, groundwater dependant ecosystems and surface waters.

If decant flows towards downgradient streams it can impact on surface water quality, and if multiple decants would occur into the same stream, there would be a cumulative impact on the water quality due to increased salt load. This could be a cumulative impact of high significance, and the possibility of decant for each proposed mining activity and the cumulative effects of these should be properly mitigated.

13.2.10 Socio-economic

Cumulative impacts are those impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned, or defined developments (including third-party developments) at the time that the risks and impacts identification process is conducted (IFC PS 1, 2012). Potential cumulative impacts associated with the Project and the potential of more mines being established in the study area are outlined in Table 13-5.

Table 13-5: Potential Cumulative Impacts related to the Project

Cumulative Impact	Mitigation Measures
• Compounded effects of lighting, noise, traffic, water pollution, dust emission, groundwater abstraction and physical reduction in habitat impacts community health and safety.	• Implement all mitigation measures recommended by the associated Specialist Studies in collaboration with other active mines in the study area.
• Economic dependency on surrounding mines will negatively impact local, regional, and national economies with closure and mine closure.	• Collaborate with government, agencies, and civil society to identify alternative economic activities in the study area.
The presence of multiple mines in the study area is likely to result in the influx of business and job seekers attracted by the economic activities. The increased in-migration of people may result in: • Urban sprawl, housing backlog and / or growth of informal settlements. • Increased social capital associated with an increase in number of highly educated and	• Develop and implement an In-migration Plan in collaboration with government, civil society, and other active mines in the study area.

Cumulative Impact	Mitigation Measures
skilled people searching for economic opportunities associated with the mines. • Increased the pressure on water resources for local communities. • Increased population, demand for goods and services, and constraints on supply because of pressure on resources, will all contribute to inflation in local prices and increased economic vulnerability of local people, those who are already vulnerable. • Increased anti-social behaviours will adversely affect the lives of the local population.	
• Increased risks associated with road traffic accidents between humans, livestock, game, and mining vehicles. In some cases, this will lead to fatalities.	• Make financial provisions to be used in case of reported and proven incidences of health, safety, and security issues.
• The increase in the number of mines in the area may result in a decreased ambient air quality due to the increase in carbon dioxide emissions associated with increased vehicle movement, machinery, and equipment on mine sites as well as blasting activities. This may, in turn, result in poor health outcomes to those exposed to it.	• Implement recommendations and mitigation measures as per the air quality specialist study as well comply with the national and international standard procedures and protocols for active open cast mining. • Development and implementation of a grievance procedure. • Make financial provisions to be used in case of reported and proven incidences of health, safety, and security issues.
• The presence of multiple active mines in the area has a potential to cause structural damage through blasting and the movement of heavy-duty vehicles; thus, causing health and safety risks to those dwelling in such structures.	• Implement mitigation measures outlined in the blasting, vibrations, and traffic specialist studies. • Collaborate with other mines in the area to develop and implement long-term health and safety procedures and protocols to minimise and avoid the impacts. • Development and implementation of a grievance procedure. • Make financial provisions to be used in case of reported and proven incidences of health, safety, and security issues.

13.3 The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be Affected

Section 9.1 above provides an explanation of the site layout, alternatives and aspects that were considered during the finalisation of the layout. The Impact Assessment detailed in Section 13.1 describes all identified potential impacts associated with the preferred site layout and planned Project activities.

13.4 The Possible Mitigation Measures that could be Applied and the Level of Risk

Mitigation measures for each identified impact have been proposed and are presented with the impact ratings in Section 13.1 above.

13.5 Motivation where no Alternatives Sites were Considered

The DECM is an established coal mine. The location of the mine remains fixed and will not be relocated or changed. The additional infrastructure requiring authorisation as part of this Application will be established on an environmentally authorised land.

13.6 Statement Motivating the Alternative Development Location within the Overall Site

The location of the Project has been decided by the location of the identified coal resource, and the additional infrastructure associated with this application have been determined based on their intended use. Construction of the additional surface infrastructure, new STP, a new WTP, and a water storage tank except for the road, was undertaken based on Dorstfontein East Coal Mine's need for continuing with mining operations. Since mining and extraction can only occur at the location of an ore body, it is not feasible to consider alternative locations. The proposed property has indicated the presence of coal.

The alternatives considered for the new proposed activities have been detailed in Section 9 above.

14 Full Description of the Process Undertaken to Identify, Assess and Rank the impacts and Risks the Activity will Impose on the Preferred Site (In Respect of the Final Site layout Plan) Through the Life of the Activity

The identification, assessment and ranking of potential new impacts associated with the Project were informed by the environmental and technical specialist investigations undertaken. The impacts associated with the closure and rehabilitation Project are presented in Table 15-1.

15 Assessment of Each Identified Potentially Significant Impact and Risk

15.1 Identified Potentially Significant Impacts of the Proposed Project

Table 15-1 provides all identified impacts associated with the construction, operational, closure, rehabilitation and post closure phase aspects.

Table 15-1: Assessment of each Identified Potentially Significant Impact of the proposed Project

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Construction	Access road construction, movement of vehicles, and heavy machinery.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 60	Negligible (negative) - 32
Construction	Site clearing and preparation by the removal of vegetation and topsoil, leading to the exposure of soils for site establishment.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Increased wind and water erosion and consequently sedimentation potential; • Removal of vegetation and basal cover resulting in loss of topsoil, organic material and increased erosion potential; and • Compaction, ponding, and changing the natural landscape of the area.	Moderate (negative) - 84	Negligible (negative) - 30
Construction	Construction of surface infrastructure	Soil, Land Use, and Land Capability	• Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Increased hardened surfaces resulting in increased hydrological functioning; • Diggings, removal, and shifting of soil; • Potential spillage of sewage wastewater and hydrocarbons such as oils, fuels and grease, thus contamination of the soils; and • Increased dust, erosion, and sedimentation.	Moderate (negative) - 84	Negligible (negative) - 30
Construction	Waste management activities, including: • In-pit RoM Stockpiling; • Handling of hydrocarbon chemicals;	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Soil contamination from sewage and wastewater; and • Soil compaction resulting from the movement of heavy machinery within the Project Area.	Minor (negative) - 66	Negligible (negative) - 29

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
	• Hauling and transportation of waste material; • Transportation of product coal; and Disposal of waste material				
Construction	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	Minor (negative) -52	Negligible (negative) -32
Construction	Construction of infrastructure, and ventilation Shafts.	Fauna and Flora	• Increased faunal casualties; and • Changes to the landscape, causing ponding and undulating topographies.	Minor (negative) -40	Negligible (negative) -20
Construction	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	Minor (negative) -44	Negligible (negative) -20
Construction	Stockpiling of soils, rock dump	Fauna and Flora	• Compaction of soils; • Low vegetation growth. If stockpiles unvegetated, potential erosion • Increased run off and erosion.	Minor (negative) -44	Negligible (negative) -24
Construction	Access road construction,	Wetlands	• Erosion and sedimentation; and • Soil compaction and or disturbance.	Minor negative (-60)	Minor negative (-32)
Construction	Site clearing, including the removal of vegetation and disturbance of soils	Wetlands	No wetlands will directly be impacted, however secondary impacts might occur as activities are proposed within 100 m and 500 m of wetlands. Secondary impacts include: • Erosion and sedimentation; • Loss of fauna and flora (biodiversity); and • Increased AIPs.	Negligible (negative) (-27)	Negligible (negative) (-10)
Construction	Construction of mine related surface infrastructure	Wetlands	• Increased hardened surface, runoff and onset of erosion and sedimentation; • Decreased wetland habitat, functionality and integrity;	Minor (negative) (-60)	Negligible (negative) (-33)

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
			• Soil, water and wetland contamination.		
Construction	Waste management activities	Wetlands	• Contamination from Hydrocarbon waste (lubricants, oils explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland health and biodiversity.	Moderate (negative) – 85	Minor (negative) (-65)
Construction	Site clearance and construction of proposed infrastructure.	Aquatics	• Land and vegetation manipulation/clearing in proximity to the watercourses.	Minor (negative) – 60	Negligible (negative) – 27
Construction	Site preparation including vegetation clearance and excavations, leading to exposure of soils.	Hydropedology	• Siltation and sedimentation of water resources leading to deteriorated water quality.	Minor (negative) -72	Negligible (negative) -18
Construction	Handling of hydrocarbons and other chemicals; Loading, hauling and transportation of product coal.	Hydropedology	• Contamination of water resources leading to deterioration of water quality.	Minor (negative) -70	Negligible (negative)-18
Construction	Site preparation and excavations. Stockpiling of spoils and discard.	Surface water	• Sedimentation and siltation of nearby watercourses most likely leading to deteriorated water quality.	Minor (negative)- -40	Negligible (negative) -14
Construction	Washing off, of oils, fuels and other hydrocarbon spills during the construction of facilities such as offices, ablutions, storerooms, workshops, storage dams, process plant, roads, pipelines, power lines and conveyors.	Surface water	• Surface water contamination and deterioration of water quality.	Minor (negative) -55	Negligible (negative) -12
Construction	Site Clearing, Construction of Haul	Air Quality	• Reduction in ambient air quality.	Negligible (negative) – 30	Negligible (negative) – 12

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
	Roads and Surface Infrastructure.				
Construction	Site/vegetation clearance for site establishment (infrastructure including ventilation fans, change houses, offices, ablutions, and workshops)	Noise	• Noise will emanate from the machinery and vehicles operating during the construction activities.	Negligible (negative) – 18	Negligible (negative) – 12
Construction	In-pit RoM Stockpiling	Noise			
Construction	Access road construction	Noise			
Construction	Power line construction.	Noise	• Noise impacts are considered to be negligible therefore was not assessed further.		
Construction	Construction of infrastructure.	Noise	• Noise emissions from equipment/machinery will increase the noise levels at sensitive receivers but not enough to result in a noise disturbance		
Construction	Removal of vegetation / topsoil for establishment of mining and linear infrastructure	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation. • Potential for dust pollution.	Minor (negative) -49	Negligible (negative) -18
Construction	Construction of infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	Minor (negative) -56	Minor (negative) -42
Construction	Temporary employment creation	Socio-economic	• Temporary economic injection through income, mostly on an individual or household level.	Negligible – (positive) (24)	Minor – (positive) (40)
Construction	Project-induced in-migration	Socio-economic	• A temporary increase in certain segments of the population can place additional strain on housing and services.	Negligible – (negative) (-28)	Negligible (0)
Construction	Surface preparation for infrastructure	Heritage	• Direct negative impacts to BGG-001	Major (negative) (-126)	Moderate (positive) + (72)
Construction	Removal of vegetation / topsoil for establishment	Visual	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.	Minor (negative) -49	Negligible (negative) -18

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
	of surface infrastructure and box cutting.				
Construction	Construction of Infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	Minor (negative) -56	Moderate (negative) -42
Operational	Blasting (only when dikes and other geological features are encountered).	Soil, Land Use, and Land Capability	• Movement of the soil strata; and • Potential subsistence, causing ponding and undulating topographies	Moderate (negative) - 60	Negligible (negative) - 32
Operational	Underground mining machinery maintenance.	Soil, Land Use, and Land Capability	• Soil Contamination; and • Soil compaction.	Minor (negative) - 66	Negligible (negative) - 28
Operational	Use of existing haul roads and vehicle movement.	Soil, Land Use, and Land Capability	• Compaction of soil; • Increased runoff potential; • Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 65	Negligible (negative) - 32
Operational	In-pit ROM Stockpiling.	Soil, Land Use, and Land Capability	• Soil Contamination from ROM stockpiles, leaching, erosion, sedimentation of contaminants; • Loss of vegetation and habitat due to high contaminates in soils; and • Erosion and sedimentation from ROM Stockpiling areas.	Moderate (negative) - 66	Minor (negative) - 36
Operational	Operation of water and sewer reticulation. Waste management activities.	Soil, Land Use, and Land Capability	• Soil contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); and • Soil contamination from sewage and wastewater	Moderate (negative) - 66	Negligible (negative) - 32

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Operation of the coal discard processing plant.	Soil, Land Use, and Land Capability	• Contamination of soil; • Increased runoff; and • Increased erosion and consequently sedimentation potential.	Moderate (negative) - 78	Minor (negative) - 36
Operational	Underground blasting and operation of the underground workings.	Fauna and Flora	• Subsidence of areas that have been destabilised by underground workings; • Potential contamination of underground water and air; and • Increased risk of erosion.	Minor (negative) -52	Minor (negative) -44
Operational	Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas	Fauna and Flora	• Habitat disturbances and increased soil erosion, soil contamination and compaction. • Increased faunal casualties (roadkill); • Increased erosion and sedimentation decreasing vegetation cover; • Dust pollution, and AIP proliferation; • Ensure maintenance of infrastructure to prevent any spillages thus preventing contamination of the soil; • Increased vehicle movement in the area, increasing soil compaction, and runoff potential; and • Unexpected changes in the topography and overall habitats.	Minor (negative) -40	Negligible (negative) -20
Operational	Increased use of access road and haul roads	Fauna and Flora	• Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation.	Minor (negative) -44	Negligible (negative) -20
Operational	Diesel storage and explosives magazine.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement causing potential spills.	Minor (negative) -52	Negligible (negative) -32
Operational	Blasting (only when dikes and other geological features are encountered).	Wetlands	• Movement of the strata causing potential subsistence, resulting in ponding and undulating topographies; and • Dewatering and drying out of wetlands.	Major (negative) (-119)	Moderate (negative) (-90)
Operational	Underground mining machinery maintenance.	Wetlands	• Contamination and deterioration of soil and water quality and quantity; and • Loss or changes to natural wetland PES, ES and EIS.	Moderate (negative) – 75	Minor (negative) – 48

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Use of existing haul roads and vehicle movement.	Wetlands	• Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential into wetlands; • Loss of vegetation and habitat; and • Wetland fragmentation.	Minor (negative) (-65)	Minor (Negative) (-40)
Operational	In-pit ROM Stockpiling.	Wetlands	• Potential runoff from topsoil and subsoil stockpiles causing sedimentation into the wetlands; • Erosion and sedimentation of contaminants into the wetland areas.	Minor (negative) (-56)	Negligible (negative) (-30)
Operational	Operation of water and sewer reticulation. Waste management activities.	Wetlands	• Contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); • Contamination from sewage and wastewater; and • Changes to wetland integrity and biodiversity.	Moderate (negative) (-75)	Minor (negative) (-44)
Operational	Operation of the coal discard processing plant.	Wetlands	• Contamination of soil, water and wetlands; • Loss of wetland health and biodiversity; and • Loss of wetland functionality.	Moderate (negative) (-96)	Minor (negative) (-65)
Operational	Uncontrolled runoff of stormwater or process water from or through the surface infrastructure	Aquatics	• Water quality and habitat deterioration of watercourses receiving unnatural/contaminated runoff.	Minor (negative) – 65	Negligible (negative) – 21
Operational	Runoff from the dirty water areas or catchments (coal stockpile areas, mine processing plant, workshops etc.).	Hydropedology	• Surface water contamination and deterioration of water quality on the natural water resources.	Moderate (negative) - 60	Negligible (negative) -18
Operational	Hydrocarbons and chemicals spillages and leakages from equipment, moving haulage trucks and machinery.	Hydropedology	• Water contamination by hydrocarbon waste and deterioration of water quality through runoff and potential groundwater contamination where leaks and spillages occur within recharge soils.	Minor (negative) -72	Negligible (negative) -18

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Hydrocarbon and chemical spillages and leakages from equipment, moving vehicles and machinery during mining, processing, loading and hauling of the product coal.	Surface water	• Surface water contamination by hydrocarbon waste and deterioration of surface water quality	Minor (negative) -48	Negligible (negative) -27
Operational	Runoff from contaminated areas such as Waste Rock Dumps (WRDs), STP and discard processing plant may pollute nearby surface water resources.	Surface water	• Surface water contamination by runoff from dirty areas and deterioration of surface water quality.	Minor (negative) -70	Negligible (negative) -32
Operational	Active mine dewatering will be required to ensure dry working conditions in the open pits and underground mining areas. The dewatering will cause ground levels to be drawn down in the vicinity of the mining area.	Groundwater	• Mine dewatering causing lowering of groundwater levels	Minor (negative) -42	Minor (negative) -39
Operational	Mine dewatering causing a decrease in groundwater reserves	Groundwater	• Due to active mine dewatering required to ensure dry working conditions in the open pits and underground voids, certain groundwater volumes will be extracted from the open pits and underground mining areas, limiting the groundwater resource.	Minor (negative) -36	Negligible (negative) -33
Operational	AMD formation in pits, underground voids and co-disposal facility; other surface sources that could cause groundwater contamination.	Groundwater	• Due to AMD formation in the mining areas and co-disposal facility, or any seepage from infrastructures, the groundwater quality could be impacted upon.	Negligible (negative) -22	Negligible (negative) -18

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Establishment of Open Underground Mine, Ventilation Shaft, In-pit Stockpiling and Operation of the Discard Plant.	Air Quality	• Dust generation and reduction in ambient air quality.	Major (negative) – 78	Negligible (negative) – 36
Operational	Mining of coal by underground mining	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.	Negligible (negative) – 27	Negligible (negative) – 24
Operational	Blasting (only when dikes and other geological features are encountered)	Noise			
Operational	In-pit ROM Stockpiling	Noise	• Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.		
Operational	Diesel storage and explosive magazine	Noise	• Noise impacts are considered to be negligible therefore was not be assessed further.		
Operational	Underground Mining Machinery Maintenance	Noise	• Noise emissions from equipment/machinery will increase the noise levels that nearby sensitive receivers are exposed too but will not result in a noise disturbance.		
Operational	Operation of water and sewer reticulation	Noise			
Operational	Use of existing haul roads	Noise			
Operational	Long term employment creation	Socio-economic	• Extended employment periods at the mine through the extension of the LoM.	Minor – (positive) (36)	Minor – (positive) (55)
Operational	Project-induced in-migration	Socio-economic	• An increase in certain segments of the population can place additional strain on housing and services.	Minor – (negative) (-40)	Negligible – (negative) (-24)
Operational	Skills training	Socio-economic	• As per the requirements of the SLP, the workforce and some of the local community will be upskilled in line with the mine's skills development plan.	Minor – (positive) (70)	Moderate – (positive) (77)

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Social investment in local communities	Socio-economic	• The mine is currently implementing mine community development projects and will continue to do so under this project that extends the LoM and the mine's SLP commitments.	Minor – (positive) (52)	Minor – (positive) (70)
Operational	Multiplier effects on the local and regional economy	Socio-economic	• Through the expansion of the DEMC, direct and multiplier effects will continue for a further 14 years.	Minor – (positive) (44)	Moderate – (positive) (96)
Operational	Continuation in nuisance factors	Socio-economic	• The extended LoM implies an extension and intensification of certain nuisance factors such as blasting, resulting in continued noise and dust pollution and other issues.	Minor - (negative) (-55)	Minor - (negative) (-45)
Operational	Continued competition over water resources	Socio-economic	• Water is a scarce resource, and the expansion of the mine could further impact on this limited resource.	Minor - (negative) (-60)	Negligible - (negative) (-33)
Operational	Community health, safety, and security	Socio-economic	• Continuation and expansion of mining activities will lead to a possible increase and continuation of impacts associated with community health, safety, and security.	Minor - (negative) (-65)	Negligible - (negative) (-30)
Operational	Operation of surface infrastructure (discard wash plant, workshop area, and related infrastructure)	Visual	• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.	Moderate (negative) -84	Minor (negative) -60
Operational	Lighting of mine infrastructure at night	Visual	• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.	Negligible (negative) - 32	Slightly Detrimental -24
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Soil, Land Use, and Land Capability	• Compaction of soil; • Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology; and • The proliferation of AIPs, changing the soil biodiversity, and potential.	Minor (negative) - 50	Negligible (negative) - 32

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Demolition of infrastructure and rehabilitation of affected areas.	Soil, Land Use, and Land Capability	• Disturbance of soils and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; and • Ponding of water and creation of drainage channels.	Minor (negative) - 65	Negligible (negative) - 24
Closure	Post-closure monitoring and rehabilitation.	Soil, Land Use, and Land Capability	• Minimal negative impacts on the environment; • AIPs Monitoring Plan; and • Soil compaction and increased runoff potential due to vehicle movement during rehabilitation programs.	Minor (negative) -55	Moderate (Positive) 91
Closure	Demolition and removal of infrastructure	Fauna and Flora	• Disturbance of soils, and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape.	Minor (negative) -44	Negligible(negative) -24
Closure	Post-closure monitoring and rehabilitation	Fauna and Flora	• Minimal negative impacts on the environment; • Activities involve the rehabilitation processes of reprofiling the soils and re-vegetation thereafter; • Impacts include the possibility of erosion and sedimentation; • Proliferation of AIPs; and • Change in the habitat and species composition.	Minor (negative) -50	Positive Impact (positive) 66
Closure	Closure of the underground mine.	Fauna and Flora	• Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats; and • Change in the land topography and species composition.	Minor (negative) -56	Negligible (negative) -33

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Wetlands	• Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology of the wetlands; and • The proliferation of AIPs. • Exposure of soils and subsequent compaction, erosion, and sedimentation into the wetlands; • Deterioration of water quality; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of wetlands.	Minor (negative) (-78)	Minor (negative) (-36)
Closure	Post-closure monitoring and rehabilitation.	Wetlands	• Onset of erosion and sedimentation; and • AIPs proliferation.	Negligible (negative) (-32)	Negligible (negative) (-10)
Closure	Post-mining decants into wetlands and streams	Wetlands	• Water, soil and wetland contamination; • Decreased PES, ES and EIS; and • Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use.	Major (negative) – 119	Moderate (negative) (– 105)
Closure	Seepage and runoff of contaminated water entering aquatic ecosystems.	Aquatics	• Water quality deterioration of watercourses in contact with contaminated water resulting in AMD.	Minor (negative) – 108	Negligible (negative) – 15
Closure	Demolition of mine infrastructure (PCDs, workshops, haul roads, processing plant etc.) Disturbance of soils and erosion by overland flow.	Hydropedology	• Sedimentation and siltation of nearby watercourses and deterioration of water quality.	Moderate (negative) - 84	Negligible (negative) -18
Closure	Rehabilitation of disturbed sites close to pre-mining conditions.	Hydropedology	• Restoration of pre-mining streamflow regime in nearby watercourses.	Moderate (positive) - 90	
Closure	Potential risk of subsidence.	Hydropedology	• The mined-out areas may be prone to subsidence.	Moderate (negative) - 96	Minor (negative) - 40

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Disturbance of soils during removal of infrastructure at closure	Surface water	• In-stream water quality and quantity deterioration from sedimentation and siltation.	Minor (negative) -60	Negligible (negative) 24
Closure	Spillages of hydrocarbons (oils, fuels and grease) by vehicles and machinery used during demolition and transportation of material from decommissioned infrastructure	Surface water	• Surface water contamination due to hydrocarbon waste spillages.	Moderate (negative) - 96	Minor (negative) -40
Closure	Reaction of sulphide compounds in extracted coal residues with water and oxygen, causing Acid Mine Drainage (AMD) and decant to low-lying areas.	Surface water	• Contamination of soil and water resources from potential decant of AMD and movement of contamination plumes due to the re-watering of the backfilled pit.	Moderate (negative) - 96	Minor (negative) -40
Closure	Mine Dewatering and residual effect on rebounding groundwater levels.	Groundwater	• Due to the dewatering activities during the operational phase, groundwater levels surrounding the mining areas will be subdued at the start of the Post Closure Phase, after it will gradually recover towards pre-mining levels.	Minor (negative) -42	Minor (negative) -39
Closure	AMD formation in open pits, underground voids and co-disposal facility.	Groundwater	• Due to AMD taking place within the backfilled open pits and in co-disposal facility, groundwater contamination with elevated sulphate and low pH could occur.	Moderate (negative) - 90	Minor (negative) -60
Closure	Mine decant causing contamination of groundwater.	Groundwater	• If groundwater levels within the open pits recover to elevations higher than surface elevations, this water may then flow from the pit areas and cause groundwater contamination down gradient of the mine.	Moderate (negative) - 84	Minor (negative) -42
Closure	Demolition and Removal of Infrastructure and Rehabilitation.	Air Quality	• Dust generation and reduction in ambient air quality.	Major (negative) – 42	Negligible (negative) – 20

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Closure	Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation.	Noise	• The demolition equipment/machinery will generate noise leading to an increase in noise levels onsite and at sensitive receivers; and • However, the removal of noise generating sources will lead to a reduction in the noise levels.	Negligible (negative) – 18	Negligible (negative) – 12
Closure	Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation.	Noise	• Noise impacts are considered to be negligible therefore will not be assessed further.		
Closure	Post-closure monitoring and rehabilitation.	Noise			
Closure	Post-closure monitoring and rehabilitation.	Socio-economic	• Economic Contraction	Moderate - negative (-90)	Minor - negative (-60)

15.2 Identified Potential Impacts at DECM (Current Mining)

Table 15-2 below provides all identified impacts associated with the operational phase aspects which were undertaken by GCS (Pty) Ltd [Ref. No. MP 30/5/1/2/2/51MR], June 2008. These impacts are still applicable to the current mining operation at DECM, the EMP is appended to this report as Appendix S.

Table 15-2: Impacts Identified and mitigation measures approved for Current Mining

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Mining of Coal	Opencast	Geology	Removal of the geological coal and associated resources.	• Make optimal utilisation of the coal resources which forms part of the mining rights area; • The mining operations must remain within the limits of the designated mining rights area.
		Underground		Removal of the geological coal and associated resources	
Operational	Mining of Coal	Opencast	Topography	The stockpiling and removal of material as result of cut and fill methods will impact on the micro and macro topography due to the construction of opencast operations.	• Progressive rehabilitation must take place as soon as possible after each opencast block has been mined.
		Underground	Topography	Potential subsidence due to presence of Topography underground mining operations.	• Ongoing monitoring must be undertaken of the surface area to determine whether any subsidence is taking place; • The underground mining operations must be undertaken by means of stabilizing infrastructure (pillars) to reduce the potential of subsidence; and • Should subsidence be detected it must be made safe and rehabilitated as soon as possible.
Operational	Co-disposal Facility		Topography	The stockpiling, dumping and pumping of material as result of operational activities will impact on the micro and macro topography due to the construction of the co-disposal facility.	• The co-disposal facility must be designed with the mind on closure; • The co-disposal facility should be shaped to blend in with the surrounding topography as far as possible.
Operational	Mining of Coal	Opencast	Soils Land Use and Land Capability	Erosion with regards to opencast mining	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness.; • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					implemented. See management and monitoring programs in EMP for fertilizer usage as recommended by specialist; and • Fairly standard fertilizer treatments will be needed for optimum agricultural production of crops on areas that have previously been planted, and/or stockpiled for any length of time.
Operational	Mining of Coal	Opencast	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of opencast mining.	• The mine will ensure that equipment movement over the undesignated mining areas and topsoil stockpiles will be limited to avoid soil compaction and subsequent damage to soil structure or the seed bank; • Should vegetation be required, fertilizer will be applied to the topsoil stockpiles prior to vegetation; • Vegetation establishment in disturbed areas will be undertaken as soon as practically possible, with the growing season and water availability being the primary constraints. See management and monitoring programs in EMP for fertilizer usage as recommended by specialist; • There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.; • A detailed waste management strategy will be established and implemented; Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies. • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989); • Should chemical toilets be utilised the sewage must be removed by a licensed company; and • The mine must adopt the cradle to grave principle.
Operational	Mining of Coal	Opencast	Soils Land Use and Land Capability	Soil compaction due to different types of soils, and their wetness factor, during mining operations.	• Compaction is a problem to contend with if these soils are to be worked during the wet months of the year;

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Stockpiling of these soils should be done separately from the dry soils, and greater care is needed with the management of erosion problems during storage; and • Any strong structure that develops during the stockpiling stage will need to be dealt with prior to the use of this material for rehabilitation.
Operational	Mining of Coal	Underground	Soils Land Use and Land Capability	Erosion with regards to underground mining and the construction and upkeep of all highwalls, stockpiles, berms and adits.	• Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness. •
Operational	Mining Related Infrastructure	Conveyors	Soils Land Use and Land Capability	Erosion with regards to operation of conveyors	• The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • Areas where erosion control measures have been implemented must be inspected on a weekly basis t determine the effectiveness; and • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented.
Operational	Mining Related Infrastructure	Oil and Diesel Storage	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of oil and diesel storage.	• No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area; • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within; • A spill contingency plan should be available and enforced; • Spill clean up kits should be available at each area where hydrocarbons are being utilised;

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. MSDS sheets should be available where hydrocarbons or other chemicals are stored; • There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies; and • The mine must adopt the cradle to grave principle.
Operational	Mining Related Infrastructure	Generation of Mine Waste	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of mine waste	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities;If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site;After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; Best waste management practices should be emphasized during the induction phase and on ongoing basis; and Waste should be removed by licensed waste disposal companies. • The mine must adopt the cradle to grave principle.
Operational	Mining Related Infrastructure	Generation of Domestic and Hazardous Waste	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of domestic and hazardous waste	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities;If spills

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies. • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989) ; • Should chemical toilets be utilised the sewage must be removed by a licensed company; and • The mine must adopt the cradle to grave principle.
Operational	Mining Related Infrastructure	Sewage	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of sewage	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies;Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989) ; • Should chemical toilets be utilised the sewage must be removed by a licensed company;and • The mine must adopt the cradle to grave principle.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Mining Related Infrastructure	Water Storage Facilities	Soils Land Use and Land Capability	Soil physical and chemical degradation at water storage facilities and spillages during operations	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies;and • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	RoM Stockpiles	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of RoM stockpiles and spillages during operations	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies;and • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Workshops and other Buildings	Soils Land Use and Land Capability	Erosion with regards to workshops and buildings.	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented;

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness;and • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented.
Operational	Plant and Related Activities	Diesel and Chemical Storage	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of diesel and chemical storage.	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies. • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989) ;and • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Salvage Yard	Soils Land Use and Land Capability	Erosion with regards to the selvage yard.	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness;and

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented.
Operational	Plant and Related Activities	Water Management Facilities	Soils Land Use and Land Capability	Erosion from slopes around water management facilities and pipelines due to heavy rain, extreme weather events or return water dam and pollution control dam leaks.	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness; and • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented.
Operational	Co-disposal Facility		Soils Land Use and Land Capability	Erosion with regards to the co-disposal facility.	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness.
Operational	Co-disposal Facility		Soils Land Use and Land Capability	Soil physical and chemical degradation as result of the co-disposal facility and possible spillages that might occur during operations.	• There will be an incident management system including procedures and training for dealing with incidents; Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies; • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989) ;and • The mine must adopt the cradle to grave principle.
Operational	Coal Product Supply	Coal Product Stockpiles	Soils Land Use and Land Capability	Erosion with regards to operation phase of coal product stockpiles	• Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; and • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness.
Operational	Coal Product Supply	Coal Product Stockpiles	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of coal product stockpiles and spillages of coal.	• There will be an incident management system including procedures and training for dealing with incidents; • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities; • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated; • A detailed waste management strategy will be established and implemented; • Best waste management practices should be emphasized during the induction phase and on ongoing basis; • Waste should be removed by licensed waste disposal companies; • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989) ;and

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• The mine must adopt the cradle to grave principle.
Operational	Coal Product Supply	Rapid Load Out	Soils Land Use and Land Capability	Erosion with regards to the rapid load out facility	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible; • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented; • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%; • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge; • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness; • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented. See management and monitoring programs in EMP for fertilizer usage as recommended by specialist; and • Fairly standard fertilizer treatments will be needed for optimum agricultural production of crops on areas that have previously been planted, and/or stockpiled for any length of time.
Operational	Coal Product Supply	Rapid Load Out	Soils Land Use and Land Capability	Soil physical and chemical degradation as result of spillages at rapid load out facility.	• There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. • A detailed waste management strategy will be established and implemented. • Best waste management practices should be emphasized during the induction phase and on ongoing basis. • Waste should be removed by licensed waste disposal companies. • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989). • Should chemical toilets be utilised the sewage must be removed by a licensed company. • The mine must adopt the cradle to grave principle.
Operational	Coal Product Supply	Railway Line	Soils Land Use and Land Capability	Erosion with regards to operation of the railway line.	• Vegetation establishment in disturbed areas will be undertaken as soon as practically possible. • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e. dust allying agent, terraces, rock cladding, etc.) must be implemented. • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%. • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (railway lines, power lines, conveyors, pipelines etc.) and points of water discharge. • Areas where erosion control measures have been implemented must be inspected on a weekly basis to determine the effectiveness. • Soil replacement and the preparation of a seedbed to facilitate the revegetation program to limit potential erodibility should be implemented. See management and monitoring programs in EMP for fertilizer usage as recommended by specialist. • Fairly standard fertilizer treatments will be needed for optimum agricultural production of crops on areas that have previously been planted, and/or stockpiled for any length of time.
Operational	Mining of Coal	Opencast	Ecology	Removal of all vegetation. The impact on the vegetation will be due to the increase size in the opencast area. Nearly all the vegetation to be impacted are grasses that are growing on disturbed sites or invader weeds	• Impact on the vegetation could be mitigated if a roll over method is used during opencast mining. Revegetate backfilled areas as soon as possible after mining with the main grass species
Operational	Mining of Coal	Opencast	Ecology	Destruction of natural habitat for fauna. The loss of vegetation will have an effect on the animal live.	• It is likely that the animals will move to the surrounding areas when mining activities start. The animals will move back once mining activities have ceased and rehabilitation has taken place.
Operational	Mining of Coal	Opencast	Ecology	Increase in alien invasive species. Due to the disturbance of the mining activities, the potential for the spreading of invasive alien plant species increase.	• A plan to eradicate invasive alien species must be established on site
Operational	Mining of Coal	Opencast	Ecology	Erosion of Topsoil. Due to the removal of topsoil and sub-soils and the ongoing stockpiling thereof during the operational phase, the potential of soil erosion increase.	• Dust must be suppressed by using a dust suppression method. Revegetation of area if exposed for longer than 18 months.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Mining of Coal	Opencast	Ecology	Windblown dust from the conveyor transportation, stockpiles, co-disposal facility and from the opencast pit could prohibit the photosynthesis process in plants. This could cause reduced growth rates and plant vigour.	• Dust must be suppressed by using a dust suppression method. Dumps should be revegetated to decrease the amount of dust. • A dust management plan that includes some of the following mitigation measures must be implemented on the mine: • Water sprays must be used in the loading of stockpiles (50% reduction). • Variable height in stackers should also be implemented (25% reduction. • Telescoping chute with water sprays could reduce the emission by 75%. • Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient monitoring must be implemented with dust monitors concentrated to the west of the site.
Operational	Mining Related Infrastructure	Conveyors	Ecology	Windblown dust from the conveyor transportation, stockpiles, co-disposal facility and from the opencast pit could prohibit the photosynthesis process in plants. This could cause reduced growth rates and plant vigour.	Dust must be suppressed by using a dust suppression method. Dumps should be revegetated to decrease the amount of dust.
Operational	Infrastructure	Oil and Diesels Storage	Ecology	Avoid unnecessary impacts on the flora and fauna.	• No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean up kits should be available at each area where hydrocarbons are being utilised. • During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored. Contain the impacts to the smallest areas and remove all foreign materials from the area. No littering. No spills. • There will be an incident management system including procedures and training for dealing with incidents.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities.
Operational	Infrastructure	Generation of Mine Waste	Ecology	Windblown dust from the conveyor transportation, stockpiles, co-disposal facility and from the opencast pit could prohibit the photosynthesis process in plants. This could cause reduced growth rates and plant vigour.	Dust must be suppressed by using a dust suppression method. Dumps should be revegetated to decrease the amount of dust.
Operational	Infrastructure	Generation of Mine Waste	Ecology	Avoid unnecessary impacts on the flora and fauna resulting from the generation of mine waste.	• Contain the impacts to the smallest areas and remove all foreign materials from the area. • Avoid all spills or incidents with mine waste. • There will be an incident management system including procedures and training for dealing with incidents.
Operational	Infrastructure	Generation of Domestic and Hazardous Waste	Ecology	Avoid unnecessary destruction of fauna and flora from resulting impacts of improper domestic and hazardous waste handling procedures.	• Contain the impacts to the smallest areas and remove all foreign materials from the area. • Avoid littering around site, remove all waste from site through proper waste management procedures. • Avoid all spills or incidents regarding domestic and hazardous waste. • There will be an incident management system including procedures and training for dealing with incidents.
Operational	Plant and Related Activities	RoM Stockpiles	Ecology	Windblown dust from the conveyor transportation, stockpiles, co-disposal facility and from the opencast pit could prohibit the photosynthesis process in plants. This could cause reduced growth rates and plant vigour.	• Dust must be suppressed by using a dust suppression method; • A dust management plan that includes some of the following mitigation measures must be implemented on the mine; • Water sprays must be used in the loading of stockpiles (50% reduction); • Variable height in stackers should also be implemented (25% reduction; • Telescoping chute with water sprays could reduce the emission by 75%; • Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated; • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced; and • Ongoing ambient and PM10 monitoring must be implemented with dust monitors concentrated to the wets of the site.
Operational	Plant and Related Activities	RoM Stockpiles	Ecology	Increase in alien invasive species. Due to the disturbance of the mining activities, the potential for the spreading of invasive alien plant species increase.	A plan to eradicate invasive alien species must be established on site.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Plant and Related Activities	Workshops and other Buildings	Ecology	Increase in alien invasive species. Due to the disturbance of the mining activities, and all infrastructure, the potential for the spreading of invasive alien plant species increase.	A plan to eradicate invasive alien species must be established on site.
Operational	Plant and Related Activities	Diesel and Chemical Storage	Ecology	Avoid unnecessary destruction of fauna and flora from resulting impacts of improper diesel and chemical storage procedures.	• Contain the impacts to the smallest areas and remove all foreign materials from the area. No littering. No spills. • There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities.
Operational	Plant and Related Activities	Salvage Yard	Ecology	Avoid unnecessary destruction of fauna and flora from resulting impacts of improper upkeep of salvage yard..	• Contain the impacts to the smallest areas and remove all foreign materials from the area. No littering. No spills. • There will be an incident management system including procedures and training for dealing with incidents.
Operational	Plant and Related Activities	Water Management Facilities and pipeline	Ecology	Avoid unnecessary destruction of fauna and flora from resulting impacts of improper water management facility and pipeline management procedures.	• Contain the impacts to the smallest areas and remove all foreign materials from the area. No littering. No spills. • There will be an incident management system including procedures and training for dealing with incidents.
Operational	Co-disposal Facility		Ecology	Increase in alien invasive species. Due to the disturbance of the mining activities, and all other infrastructure, the potential for the spreading of invasive alien plant species increase.	A plan to eradicate invasive alien species must be established on site
Operational	Coal Product	Coal Product	Ecology	Windblown dust from the conveyor transportation, stockpiles, co-disposal facility and from the opencast pit could prohibit the photosynthesis process in plants. This could cause reduced growth rates and plant vigour.	• Dust must be suppressed by using a dust suppression method. • A dust management plan that includes some of the following mitigation measures must be implemented on the mine: • Water sprays must be used in the loading of stockpiles (50% reduction). • Variable height in stackers should also be implemented (25% reduction. • Telescoping chute with water sprays could reduce the emission by 75%. • Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient monitoring must be implemented with dust monitors concentrated to the wets of the site.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Coal Product	Railway Line	Ecology	Increase in alien invasive species. Due to the disturbance of the mining activities, and all infrastructure, including the railway line, the potential for the spreading of invasive alien plant species increase.	A plan to eradicate invasive alien species must be established on site
Operational	Mining of Coal	Opencast	Surface water	Pollution of surface water resources.	• Runoff that is captured in the opencast pits should be contained in the lined pollution control dams. • Water could be utilised for dust suppression should the quality be acceptable.
Operational	Mining of Coal	Opencast	Surface water	Potential for an increase in erosion could lead to the siltation of watercourses.	• Clean and dirty water systems must be maintained to ensure that it remains effective. • Ongoing rehabilitation and the maintenance of erosion control measures must be undertaken to reduce the possibility of erosion.
Operational	Mining of Coal	Opencast	Surface water	Increase dust could lead to lead to the contamination of watercourses	• Roads, topsoil and subsoils will be sprayed with a dust allaying agent. • Ongoing rehabilitation and the maintenance of erosion control measures must be undertaken to reduce the possibility of erosion.
Operational	Mining of Coal	Opencast	Surface water	PIT 2 of the opencast mining area will impact on a non-perennial stream that is flowing through the current area where the planned activities will take place.	• Clean and dirty water systems must be maintained to ensure that it remains effective. • The clean and dirty water systems must be kept in good conditions to ensure that the river diversion and the artificial route that will be laid out for the river, will be efficient, and that there will be no further negative effects on the diverted river.
Operational	Mining Related Infrastructure	Conveyors	Surface water	Spillages of coal could impact lead to the pollution of the surrounding watercourses.	• Dirty water catchments must be as small as possible. • Where conveyors cross wetland and drainage line the conveyors should be either enclosed or measures should be in place to ensure that no spillages could come into contact with watercourses. • Ongoing water monitoring must be undertaken to ensure that no water contamination is taking place. • Should water contamination be detected measures should be in place to rehabilitate the situation.
Operational	Mining Related Infrastructure	Oil and Diesel Storage	Surface water	Spillages and the incorrect storage of diesels and chemicals could lead to the contamination of water courses	• No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean-up kits should be available at each area where hydrocarbons are being utilised.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored. There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents will be reported to the DME, DWAF, MDAL and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. • A detailed waste management strategy will be established and implemented
Operational	Mining Related Infrastructure	Generation of Domestic and Hazardous waste	Surface water	The incorrect disposal of domestic and hazardous waste could lead to the contamination of watercourses.	• A comprehensive waste management plan must be available and enforced on site. • Best waste management practices should be emphasized during the induction phase and on ongoing bases. • Waste should be removed by licensed waste disposal companies. • Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 20 Application from the DWAF in terms of the Environmental Conservation Act (Act No. 73 of 1989). • Should chemical toilets be utilised the sewage must be removed by a licensed company. • The mine must adopt the cradle to grave principle.
Operational	Mining Related Infrastructure	Water Storage Facilities	Surface water	Dirty water stored on site could contribute to the contamination of watercourses should these overflow or be unlined.	• All dirty water storage areas must be designed for a 1:100 year storm event, with additional capacity for emergency preparedness. • Secondary containment (i.e. bunded areas) must be available for emergency preparedness measures. • Operation of dams and associated infrastructure must be carried out under the supervision of a Professional Civil Engineer registered under the Engineering profession of South Africa.
				Due to the containment of dirty water, the water runoff will be reduced.	• Dirty water catchments must be kept as small as possible. • Polluted water at the bottom of the stockpiles must be captured and pumped to the pollution control dams. • Effective clean and dirty water systems must be maintained.
Operational	Plant and Related Activities	RoM Stockpiles	Surface water	The fine material from the coal stockpiles can be transported to watercourses and lead to the contamination thereof.	

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Ongoing rehabilitation must be undertaken to reduce the potential of erosion. • Ongoing water monitoring must be undertaken to determine the impact of the mining infrastructure on the surrounding watercourses. • Should it be found that pollution is taking place the mine must implement measures to rehabilitate the situation.
Operational	Plant and Related Activities	Workshops and other Buildings Diesel and Chemical Storage Water Management Facilities	See oil and diesel storage above.		
Operational	Plant and Related Activities	Salvage Yard	Surface water	Spillages and the incorrect storage of machinery and old equipment could lead to the contamination of water courses	• A clear material separation guide should be available at the storage area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean-up kits should be available at each area where hydrocarbons are being utilised.
Operational	Co disposal Facility		Surface water	The fine material from the coal stockpiles can be transported to watercourses and lead to the contamination thereof.	• Ongoing rehabilitation, where possible, must be undertaken to ensure that no erosion of the side slopes take place. • Polluted water at the bottom of the dumps must be captured and pumped to the pollution control dams.
Operational	Coal Product Supply	Coal Product Stockpiles	Surface water	The fine material from the coal stockpiles can be transported to watercourses and lead to the contamination thereof.	• Dirty water catchments must be kept as small as possible. • Polluted water at the bottom of the stockpiles must be captured and pumped to the pollution control dams. • Effective clean and dirty water systems must be maintained. • Ongoing water monitoring must be undertaken to determine the impact of the mining infrastructure on the surrounding watercourses. • Should it be found that pollution is taking place the mine must implement measures to rehabilitate the situation.
Operational	Coal Product Supply	Rapid Load Out Facility	Surface water	Spillages of coal could impact lead to the pollution of the surrounding watercourses.	• Dirty water catchments must be as small as possible. • Effective clean and dirty water systems must be maintained. • Ongoing rehabilitation must be undertaken to reduce the potential of erosion. • Ongoing water monitoring must be undertaken to determine the impact of the mining infrastructure on the surrounding watercourses. • Should it be found that pollution is taking place the mine must implement measures to rehabilitate the situation.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Coal Product Supply	Conveyor Line	Surface water	Spillages of coal could impact lead to the pollution of the surrounding watercourses.	• Dirty water catchments must be as small as possible. • Where the conveyor line cross wetland and drainage line the conveyors should be either enclosed or measures should be in place to ensure that no spillages could come into contact with watercourses. • Ongoing water monitoring must be undertaken to ensure that no water contamination is taking place. • Should water contamination be detected measures should be in place to rehabilitate the situation.
Operational	Mining of Coal	Opencast and underground mining	Groundwater	Dewatering of the aquifers due to the mine dewatering.	• The ongoing monitoring and reporting programme must be followed. The ongoing reporting on groundwater levels must be undertaken throughout all stages of the project. • If water quality or quantity is impacted on by the mine, water must be supplied to water users, if the groundwater study proofs that the mine is impacting on the groundwater. Water must be of similar quality used prior to the mining activities. • Clean and dirty water systems must be maintained to ensure that it remains effective. • The clean and dirty water systems must be kept in good conditions to ensure that aquifers will not be polluted by dirty water, and that there will be no further negative effects on the groundwater aquifers.
Operational	Mining of Coal	Opencast and underground mining	Groundwater	Contamination of surrounding groundwater from mined-out areas.	• The ongoing monitoring and reporting programme must be followed. The ongoing reporting on groundwater levels must be undertaken throughout all stages of the project. • If water quality or quantity is impacted on by the mine, water must be supplied to water users, if the groundwater study proofs that the mine is impacting on the groundwater. Water must be of similar quality used prior to the mining activities. • Clean and dirty water systems must be maintained to ensure that it remains effective. • The clean and dirty water systems must be kept in good conditions to ensure that aquifers will not be polluted by dirty water, and that there will be no further negative effects on the groundwater aquifers.
Operational	Mining of Coal	Opencast	Groundwater	Decrease in the TNC underground workings groundwater level recovery rate.	• Ensure that the amount of water that is extracted must always be smaller than the recharge figures back into the TNC mine. • Should the extraction of groundwater be more than this figure discussions must be entered into with DWAF and surrounding groundwater users. • If water quality or quantity is impacted on by the mine, water must be supplied to water users, if the groundwater study proofs that the mine

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					is impacting on the groundwater. Water must be of similar quality used prior to the mining activities.
Operational	Co-disposal facility		Groundwater	Contamination of surrounding groundwater from the co-disposal facility.	• Management measures must be put in place to reduce seepage through the base of the co-disposal facility, also under the coal-product stockpile and the RoM stockpiles. • The ongoing monitoring and reporting programme must be followed. The ongoing reporting on groundwater levels must be undertaken throughout all stages of the project. • If water quality or quantity is impacted on by the mine, water must be supplied to water users, if the groundwater study proofs that the mine is impacting on the groundwater. Water must be of similar quality used prior to the mining activities. • Clean and dirty water systems must be maintained to ensure that it remains effective. The clean and dirty water systems must be kept in good conditions to ensure that aquifers will not be polluted by dirty water, and that there will be no further negative effects on the groundwater aquifers.
Operational	Mining of Coal	Opencast	Wetlands	Loss of wetland vegetation and destruction of wetland habitat	• Opencast operations should remain within the authorised boundaries of the mining operations. • All activities must remain within the dedicated footprints of the infrastructure within the mining area. • All infrastructure associated with the opencast pits should be located outside the wetland boundaries as far as is practically possible.
Operational	Mining of Coal	Opencast	Wetlands	Increased sediment movement off the site due to erosion on bare soil surfaces and increased sediment load in the valley bottoms.	• A low berm, approximately 1m high by 2-3m wide must be established prior to the commencement of opencast operations, between the opencast workings and the valley bottom wetlands, and where possible outside the wetland boundary, to intercept flows containing suspended soils and create a depositional environment.
Operational	Mining of Coal	Opencast	Wetlands	Soil compaction in areas traversed by heavy machinery	• All activities must remain within the dedicated footprints of the infrastructure within the mining area. • All infrastructure associated with the opencast pits should be located outside the wetland boundaries as far as is practically possible. • Where compaction is evident, ongoing ripping must be undertaken to break up the compacted soil surface. • Should self-succession of vegetation not take place, the area must be revegetated.
Operational	Mining of Coal	Opencast	Wetlands	Decrease in wetland area downstream of the opencast pits due to concentration of flows.	• There is no way to mitigate against the decrease in flow volumes within the valley bottom systems and streams.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Water diverted around the opencast mines should be released in such a manner as to aid dispersion across most of the width of the downstream wetlands. • Well designed and constructed clean and dirty water management systems must be enforced to reduce the potential of erosion, siltation and compaction. • The volumes of storm water runoff should be minimized by limiting the area of impermeable surfaces and compacted soils. • Where possible storm water should be conveyed through grassed swales, rather than concrete channels to aid infiltration and reduce run off volumes. • Should storm water be discharged into wetlands, gabions should be constructed to contain erosion (this should be done in consultation with an appropriate wetland and storm water specialist. • The gabion structures should include measures to dissipate energy of flows and to disperse flows over a greater area.
Operational	Mining of Coal	Underground	Wetlands	The alteration of topography and associated alteration of wetland should subsidence occur.	• The underground operations should be designed in such a manner to reduce the possibility of subsistence by incorporating the necessary pillars and/or other designs. • Weekly surface monitoring should be undertaken to determine the effectiveness of the underground structures. • Should subsidence occur, the area should be rehabilitated to be free draining.
Operational	Mining Related Infrastructure	Conveyors	Wetlands	Decrease in water quality due to spillages from the train trucks.	• During induction and ongoing the importance of not having spillages should be explained and enforced. • The surface water quality of surrounding streams must be monitored continuously. • Should the contamination of the wetland and surrounding water resources be detected and action plan should be enforced immediately to rehabilitate the situation.
Operational	Mining Related Infrastructure	Oil and Diesel Storage	Wetlands	The potential contamination of wetlands due to the possible spillage of hydrocarbons or other chemicals.	• No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean up kits should be available at each area where hydrocarbons are being utilised.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored. • There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. • A detailed waste management strategy will be established and implemented • Best waste management practices should be emphasized during the induction phase and on ongoing basis. • Waste should be removed by licensed waste disposal companies. • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Generation of Domestic and Hazardous Waste	Wetlands	The potential contamination of wetlands due to the possible uncontained disposal of domestic and/or hazardous waste.	• A comprehensive waste management plan must be available and enforced on site. • Best waste management practices should be emphasized during the induction phase and on ongoing bases. • Waste should be removed by licensed waste disposal companies. • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Sewage	Wetlands	The potential contamination of wetlands due to the unforeseen discharge of sewage.	• Where chemical toilets are being utilised it should be removed by a licensed disposal company. • The sewage pipelines must be inspected and/or monitored on an ongoing basis. • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Water Storage Facilities	Wetlands	Erosion within the valley bottom wetlands due to the release of storm water at discharge points	• Well designed and constructed clean and dirty water management systems must be enforced to reduce the potential of erosion, siltation and compaction. • The volumes of storm water run off should be minimized by limiting the area of impermeable surfaces and compacted soils.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Where possible storm water should be conveyed through grassed swales, rather than concrete channels to aid infiltration and reduce run off volumes. • Should storm water be discharged into wetlands, gabions should be constructed to contain erosion (this should be done in consultation with an appropriate wetland and storm water specialist. • The gabion structures should include measures to dissipate energy of flows and to disperse flows over a greater area.
Operational	Plant and Related Activities	Water Storage Facilities	Wetlands	Deterioration of water quality due to release of storm water into the wetlands.	• Well designed and constructed clean and dirty water management systems must be enforced to reduce the potential of erosion, siltation and compaction. • Dirty water should not be allowed to enter the clean storm water system. • Should contaminated water enter the wetlands due to spillages or other unforeseen circumstances a wetland or water quality expert should be consulted regarding implementation of suitable mitigation and/or rehabilitation measures.
Operational	Plant and Related Activities	RoM Stockpiles	Wetlands	Deterioration of water quality due to oxidation and leaching of pyretic material during storage on site, releasing low pH, high metal and sulphate rich discharges into the surface water wetlands	• A waste characterization test should be undertaken prior to the disposal of any coal material. • The surface of the disposal area should be compacted to reduce the potential of infiltration. • Berms/drainage channels and cut off trenches should be constructed both below and above stockpiles to enable the separation of clean and dirty water. • Contaminated water (if of acceptable quality) may be utilised for dust suppression. • Groundwater monitoring boreholes must be placed strategically around all disposal sites. • Should a pollution plume be detected an action plan should be enforced immediately to pump and treat the polluted water. • The surface water quality of surrounding streams must be monitored continuously. • Should the contamination of the wetland and surrounding water resources be detected and action plan should be enforced immediately to rehabilitate the situation.
Operational	Plant and Related Activities	Workshops and other Buildings	Wetlands	The potential contamination of wetlands due to the possible spillage of hydrocarbons or other chemicals.	• No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• A spill contingency plan should be available and enforced. • Spill clean up kits should be available at each area where hydrocarbons are being utilised. • During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored. • There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents will be reported to the DME, DWAF, MDALA and the Department of Agriculture. Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. • A detailed waste management strategy will be established and implemented • Best waste management practices should be emphasized during the induction phase and on ongoing basis. • Waste should be removed by licensed waste disposal companies. • The mine must adopt the cradle to grave principle.
Operational	Plant and Related Activities	Diesel and Chemical Storage	Wetlands	The potential contamination of wetlands due to the possible uncontained disposal of domestic and/or hazardous waste.	• A comprehensive waste management plan must be available and enforced on site. • Best waste management practices should be emphasized during the induction phase and on ongoing bases. • Waste should be removed by licensed waste disposal companies. • The mine must adopt the cradle to grave principle. • No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean up kits should be available at each area where hydrocarbons are being utilised.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored.
Operational	Plant and Related Activities	Salvage Yard	Wetlands	The potential contamination of wetland due to the uncontained storage of old equipment, machinery etc.	• A clear material separation guide should be available at the storage area. • All hydrocarbons and other chemicals should be stored in bunded area with a capacity of 110% of the volume stored within. • A spill contingency plan should be available and enforced. • Spill clean up kits should be available at each area where hydrocarbons are being utilised. • During induction and ongoing all employees must be trained in how to rehabilitate contaminated spill areas. • MSDS sheets should be available where hydrocarbons or other chemicals are stored.
Operational	Plant and Related Activities	Water Pipeline	Wetlands	Erosion at the pipeline crossing point.	• The water pipeline should not be buried at wetland crossing, but rather that brackets be used to anchor the pipeline to the existing road bridge.
Operational	Co disposal Facility		Wetlands	Deterioration of water quality due to oxidation and leaching of pyretic material during storage on site, releasing low pH, high metal and sulphate rich discharges into the surface water wetlands	• A waste characterization test should be undertaken prior to the disposal of any coal material. • The surface of the disposal area should be compacted to reduce the potential of infiltration. • Berms/drainage channels and cut off trenches should be constructed both below and above stockpiles to enable the separation of clean and dirty water. • Contaminated water (if of acceptable quality) may be utilised for dust suppression. • Groundwater monitoring boreholes must be placed strategically around all disposal sites. • Should a pollution plume be detected an action plan should be enforced immediately to pump and treat the polluted water. • The surface water quality of surrounding streams must be monitored continuously. • Should the contamination of the wetland and surrounding water resources be detected an action plan should be enforced immediately to rehabilitate the situation.
Operational	Coal Product Supply	Coal Product Stockpiles	Wetlands	Deterioration of water quality due to oxidation and leaching of pyretic material during storage on site, releasing low pH, high metal and sulphate rich discharges into the surface water wetlands	
Operational	Coal Product Supply	Railway Line	Wetlands	Erosion upstream and downstream of culverts leading to increased sediment load in the wetlands.	• Culverts should be spaced along the entire width of the wetland to reduce the concentration of flows taking place. • Culvert discharges should include a rock packed mattress to prevent gully erosion. This mattress should be delta shaped, spreading from

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					the culvert at 45 degrees to both sides, and extent for approximately 6m from the culvert opening. Energy dissipaters should be included on this mattress. • Upslope of the culverts drop down weirs should be incorporated in the construction of the culverts to prevent the formation of head cuts. The walls of the drop down weir should be cast from cement and be impermeable to prevent leakage. The floor of the drop down weir should be level with the floor of the culvert, the mattress and the level of the downstream wetland surface.
Operational	Coal Product Supply	Railway Line	Wetlands	Decrease in water quality due to spillages from the train trucks.	• During induction and ongoing the importance of not having spillages should be explained and enforced. • The surface water quality of surrounding streams must be monitored continuously. • Should the contamination of the wetland and surrounding water resources be detected and action plan should be enforced immediately to rehabilitate the situation.
Operational	Coal Product Supply	Railway Line	Wetlands	The potential of concentrating flows on the upslope side of fills when crossing contours obliquely, with drying out on the downslope side.	• Where possible the railway line should cross all wetland and rivers perpendicular to the direction of flow. • Where this is not practically possible, sufficient culverts should be placed along the crossing to ensure flows remain spread across the width of the wetland.
Operational	Coal Product Supply	Railway Line	Wetlands	Interception of perched groundwater causing local desiccation.	• No mitigation is possible
Operational	Mining of Coal	Opencast	Air quality	The increase in dust dispersion with the blasting activities and associated coal resource removal.	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine: • Drilling operations must be accompanied by fabric filters (potential 99% reduction) and water sprays (70% reduction). • Blasting activities should be limited to days with limited wind where possible. • Dust suppression must be applied where possible. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Ongoing ambient monitoring must be implemented with dust monitors concentrated to the wets of the site. • When any burning areas within a stockpile or dump or the mining area may develop the area will be excavated and recompacted immediately.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Mining Related Infrastructure	Conveyors	Air quality	The potential dispersion of dust due to the transportation of coal from the opencast pits to the remainder of the processing and transportation activities.	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine: • The conveyors should be covered if dust limits are exceeded. • Water sprays should be utilised in the uploading of trucks (70% reduction). • Water prays with chemicals could reduce the emissions by 50% in the miscellaneous transfer and conveying of coal. • If the emissions still exceed levels enclosures (70% reduction) or enclosure and use of fabric filters (99% reduction) should be considered. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Ongoing ambient monitoring must be implemented with dust monitors concentrated to the wets of the site.
Operational	Plant and Related Activities	RoM Stockpiles	Air quality	The increase in dust dispersion around the RoM stockpiles and associated activities	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine: • Water sprays must be used in the loading of stockpiles (50% reduction). • Variable height in stackers should also be implemented (25% reduction). • Telescoping chute with water sprays could reduce the emission by 75%. • Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient and PM10 monitoring must be implemented with dust monitors concentrated to the wets of the site.

Operational	Co-disposal facility		Air quality	The increase in dust dispersion around the co-disposal facility and associated activities	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine:
					  • Water sprays must be used in the loading of stockpiles (50% reduction).
					  • Variable height in stackers should also be implemented (25% reduction).

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					◦ Telescoping chute with water sprays could reduce the emission by 75%. ◦ Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient and PM10 monitoring must be implemented with dust monitors concentrated to the wets of the site.
Operational	Coal Product Supply	Coal Product Stockpiles	Air quality	The increase in dust dispersion around the coal product stockpiles and associated activities	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine: ◦ Water sprays must be used in the loading of stockpiles (50% reduction). ◦ Variable height in stackers should also be implemented (25% reduction). ◦ Telescoping chute with water sprays could reduce the emission by 75%. ◦ Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient and PM10 monitoring must be implemented with dust monitors concentrated to the wets of the site.
Operational	Coal Product Supply	Coal Product Supply	Air quality	The increase in dust dispersion from and around the railway line and associated activities	• A dust management plan that includes some of the following mitigation measures must be implemented on the mine: ◦ The drop heights of drag Water sprays should be utilised in the uploading of trucks (70% reduction). ◦ If required the loading to trains must take place in an enclosed structure (70% reduction), by implementing water sprays as well the emissions levels may be reduced by 99%. • Where vehicles are used the limited of vehicle speeds, especially during high risk periods of high winds, high temperature and low humidity should be enforced. • Ongoing ambient and PM10 monitoring must be implemented with dust monitors concentrated to the wets of the site.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	Impact on graves due to the commencement of opencast operations (GY01)	• If graveyards must be exhumed and relocated • The exhumation of human remains and the relocation of graveyards are regulated by various laws, regulations and administrative procedures. • Permission for the exhumation and relocation of human remains have to be obtained from the descendants of the deceased (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local police. • The necessary permits and/or authorisations must be obtained from the SAHRA. • A consultation process of 60 days must be adhered to for graves older than 60 years. • A forensic archaeologist or reputed undertaker who is acquainted with the administrative procedures and relevant legislation must be involved whenever human remains are exhumed and relocated.
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	The impact on historical houses due to the commencement of opencast operations (HH01 and HH02).	• The historical farmsteads may not be affected by the proposed mining development before the Mpumalanga Provincial Heritage Resources Authority (Mpumalanga PHRA) has approved such alterations. • An archaeologist or historical architect accredited with the Associated for Professional Archaeologists (ASAPA) has to subject the farmstead complexes to a Phase 2 investigation prior to their destruction. • The results of the Phase 2 investigation have to be published in a report which must be preserved in the Mpumalanga PHRA's databank. • An archaeologist or historical architect accredited with the ASAPA must apply for a permit from the Mpumalanga PHRA which would authorize that the farmstead complexes with their associated remains may be destroyed.
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	The impact on a reservoir due to the commencement of opencast operations (R01).	
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	Impact on the trough due to the commencement of opencast operations (T01).	
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	The impact on enclosures due to the commencement of opencast operations (E01).	
Operational	Mining of Coal	Opencast Pit 1	Site of Historical and Cultural Importance	The impact on a short, elongated shaft due to the commencement of opencast operations (SES01).	• No management measures required. The site has been identified with no historical significance.
Operational	Mining of Coal	Opencast Pit 2	Site of Historical and Cultural Importance	Impact on a dairy due to the commencement of opencast operations (D01).	• The historical farmsteads may not be affected by the proposed mining development before the Mpumalanga Provincial Heritage Resources Authority (Mpumalanga PHRA) has approved such alterations. • An archaeologist or historical architect accredited with the Associated for Professional Archaeologists (ASAPA) has to subject the farmstead complexes to a Phase 2 investigation prior to their destruction. • The results of the Phase 2 investigation have to be published in a report which must be preserved in the Mpumalanga PHRA's databank. • An archaeologist or historical architect accredited with the ASAPA must apply for a permit from the Mpumalanga PHRA which would

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					authorize that the farmstead complexes with their associated remains may be destroyed.
Operational	General Mining Area		Site of Historical and Cultural Importance	The possible impact on site of historical and cultural significance.	• Should any graves or other sites with potential historical and/or cultural importance be identified, all activities in that vicinity must cease immediately. • The mine environmental and safety and health office must be informed. • The area must be cordoned off. • An archaeologist should be informed immediately to investigate and inspect the site to determine the importance. Should a grave be found, the SAHRA should be informed as well. t
Operational	Co-disposal facility		Site of Historical and Cultural Importance	The possible impact on site of historical and cultural significance.	• Should any graves or other sites with potential historical and/or cultural importance be identified, all activities in that vicinity must cease immediately. • The mine environmental and safety and health office must be informed. • The area must be cordoned off. • An archaeologist should be informed immediately to investigate and inspect the site to determine the importance. Should a grave be found, the SAHRA should be informed as well.
Operational	Railway Line		Site of Historical and Cultural Importance	The possible impact on site of historical and cultural significance.	
Operational	Mining of Coal	Opencast	Noise	The increase in the ambient noise levels due to the opencast mining operations and associated blasting activities at both Opencast Pit 1 and 2.	**<u>Blasting</u>** • Limit of ground vibration should not exceed 10mm/s during blasting. • Air over pressure limit of 134dB should not be exceeded generally and should not exceed 128dB near schools or churches. • No blasting is to take place during windy conditions. • The blasting schedule and location and number of blasts should be made available to all surrounding landowners and should be amended when changes take place and be redistributed. • An effective blasting design should be implemented. • Vibration monitoring should be undertaken. **<u>Equipment</u>** • Select equipment with lower sound power levels. • Install suitable mufflers on engine exhausts and compressor components. • Equipment utilised must be in good working condition and be maintained continuously. • The scheduling of equipment within the opencast pits must take into consideration the noise emissions from the equipment in order to spread them out over the interface area. **<u>Noise barriers</u>**

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Noise barriers (such as overburden dumps, trees etc.) must be established on the eastern, western and southern boundary of the property (i.e. at the farmers house on the eastern boundary, opposite the Impilo Primary School and at the farmers house on the western boundary), to reduce the noise impact. **Communication** • Open channel of communication should be established by the mine with the surrounding landowners.
Operational	Mining Related Infrastructure	Ventilation	Noise	The increase in the ambient noise levels due to the ventilation shafts.	• Equipment utilised must be in good working condition and be maintained continuously. • Fans should be ducted and the outlet of such fans to be lined with sound absorbing material. • The Fans should be faced away from the noise sensitive areas. • Install silencers for fans. • Re-locate noise sources to areas which are less noise sensitive, to take advantage of distance and natural shielding where necessary.
Operational	Mining Related Infrastructure	Conveyors	Noise	The increase in the ambient noise levels due to the conveyor lines.	• The conveyor belt will have to be closed to the one side (direction to affected parties). • The conveyor has to be placed as low as possible to the ground level (preferably lower than ground level where possible)
Operational	*Transportation of Coal via road when absolutely necessary*		Noise	*The increase in the ambient noise levels due to the necessary transportation of coal to the Eskom Power stations.*	• Vehicles utilised must be in good working condition and be maintained continuously. • Open channel of communication should be established by the mine with the surrounding landowners.
Operational	Railway line		Noise	*The increase in the ambient noise levels due to the railway line.*	• Equipment utilised must be in good working condition and be maintained continuously. • Open channel of communication should be established by the mine with the surrounding landowners.
Operational	Mining of Coal	Opencast and underground	Blasting	Impact of blasting activities on surrounding properties.	• Surrounding property owners will be informed of the blasting procedures and schedules. • An exclusion zone of 500m will be in place for the life of mine. • Scheduled blasting times will be planned in advance and will be clearly indicated on the mining area. Blasting boards, at the access routes to construction areas, will be updated 24 hours prior to the blast, displaying time and date of blast. • Employees and outside contractors will be informed of the blasting proceduresand the associated safety measures during induction.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Prior to the blasting, all vehicles and machinery will be removed from the blast area and parked at a designated site, as determined by the responsible manager. • All possible access roads will be blocked by personnel with red flags. • The mine will undertake monthly blasting monitoring to determine whether the blasting activities remain under acceptable levels. • The mine will implement a temporary testing model during initial blasting phase. Should the results indicate it necessary (vibrations above or on impact level), permanent monitoring stations will be implemented in order to establish whether any potential impact could result due to the blasting activities. The areas of most influence as identified by the temporary seismic monitoring stations will be equipped with permanent seismic monitoring stations. • Installation of electronic crack monitors will also be undertaken if it is requested by surrounding property owners. These monitors employ a single sensor that measures both weather-induced micrometre changes in crack width and those produced by habitation and ground motion-induced vibrations. • The mine will establish an open channel of communication in order to ensure that all issues and concerns are known and are addressed.
Operational	Mining of Coal	Opencast and Underground	Visual	Visual impact of mining activities, opencast and underground infrastructure on surface	• Very little mitigation is possible during operational phase, but several management measures can be put in place to minimise the overall effect, and to make rehabilitation easier. • To restore the visual quality of the landscape, it is suggested that a comprehensive rehabilitation plan be developed, based on the principles of ecological restoration. • Light pollution will be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. • Harsh, steep engineered slopes will be avoided as these could impose an additional impact on the landscape by contrasting with existing natural topographic forms and because it is difficult to sustain vegetation on steep slopes in the long term. • During operational phase of the mine, haulage roads must be serviced with non-polluting chemicals that will retain moisture in the road surface, to minimise dust, where applicable. • Visual barriers (i.e. indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection values. Grey to olive green colours in a matt finish contribute to the assimilation of features with natural backgrounds.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Ensure, wherever possible, that all existing natural flora is retained and incorporated into the site design.
Operational	Mining Related Infrastructure	Ventilation; Conveyors; Oil and Diesel Storage; Generation of Domestic and Hazardous Waste; Sewage; and Water Storage Facilities	Visual	Visual impact of mining activities, the ventilation shafts, oil and diesel storage, generation of mine waste, generation of domestic and hazardous waste, sewage and water storage facilities.	• Very little mitigation is possible during operational phase, but several management measures can be put in place to minimise the overall effect, and to make rehabilitation easier. • During operational phase of the mine, haulage roads must be serviced with non-polluting chemicals that will retain moisture in the road surface, to minimise dust. • Visual barriers (i.e. indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection values. Grey to olive green colours in a matt finish contribute to the assimilation of features with natural backgrounds. • Ensure, wherever possible, that all existing natural flora is retained and incorporated into the site design.
Operational	Plant and Related Activities	RoM Stockpiles; Workshops and other Buildings; Diesel and Chemical Storage; Salvage Yard; and Water Management Facilities	Visual	Visual impact of mining activities, the RoM stockpiles, workshops and buildings, diesels and chemical storage, the salvage yard and water management facilities..	• To restore the visual quality of the landscape, it is suggested that a comprehensive rehabilitation plan be developed, based on the principles of ecological restoration. • Light pollution will be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. • Shaping of dump and stockpiles will be implemented such that the sides of the dumps are articulated in a fashion that create areas of light and shadow interplay. • Shaping will be implemented such that the profile of the dump and stockpiles is formed to emulate natural contours of the area. • Harsh, steep engineered slopes will be avoided as these could impose an additional impact on the landscape by contrasting with existing natural topographic forms and because it is difficult to sustain vegetation on steep slopes in the long term. • During operational phase of the mine, haulage roads must be serviced with non-polluting chemicals that will retain moisture in the road surface, to minimise dust. • Visual barriers (i.e. indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection values. Grey to olive green colours in a matt finish contribute to the assimilation of features with natural backgrounds. • Ensure, wherever possible, that all existing natural flora is retained and incorporated into the site design.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Co-disposal facility		Visual	Visual impact of mining activities and the Co disposal facility.	• Very little mitigation is possible during operational phase, but several management measures can be put in place to minimise the overall effect, and to make rehabilitation easier. • To restore the visual quality of the landscape, it is suggested that a comprehensive rehabilitation plan be developed, based on the principles of ecological restoration. • Shaping of dump and stockpiles will be implemented such that the sides of the dumps are articulated in a fashion that create areas of light and shadow interplay. • Shaping will be implemented such that the final profile of the rehabilitated dump and stockpiles is formed to emulate natural contours of the area. • Harsh, steep engineered slopes will be avoided as these could impose an additional impact on the landscape by contrasting with existing natural topographic forms and because it is difficult to sustain vegetation on steep slopes in the long term. • Visual barriers (i.e. indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection values. Grey to olive green colours in a matt finish contribute to the assimilation of features with natural backgrounds.
Operational	Coal Product Supply	Coal Product Stockpiles	Visual	Visual impact of mining activities, the coal product stockpiles, the rapid load out facility and the railway line.	• To restore the visual quality of the landscape, it is suggested that a comprehensive rehabilitation plan be developed, based on the principles of ecological restoration. • Light pollution will be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. • During operational phase of the mine, haulage roads must be serviced with non-polluting chemicals that will retain moisture in the road surface, to minimise dust, where applicable. • Visual barriers (i.e. indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection values. Grey to olive green colours in a matt finish contribute to the assimilation of features with natural backgrounds. • Ensure, wherever possible, that all existing natural flora is retained and incorporated into the site design.
Operational	Coal Product Supply	Rapid Load Out Facility	Visual	Visual impact on Landscape Quality	
Operational	Coal Product Supply	Railway Line	Visual	General Visual impact	
Operational	Changes in Population Characteristics	Population Change	Socio-economic	Environmental impacts and social conflict associated with an influx of people to the area.	• The use of local labour should be maximised to limit the negative impact on the existing infrastructure, services and resources. • Housing and other infrastructural needs should pro-actively be discussed with the Emalahleni Local Municipality to ensure that the

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					additional requirements for the population increase can be met over time. • DCM to formulate a housing policy which would also cater for the increase in employees (Ideally the contractors should participate in this). • Housing allowances are preferred by the contractor companies and are provided for their employees. • Keep the union informed of the employment process – particularly the employment of specialist from other areas. • Implement education and skills development programmes to ensure an effective skills match between local people and mine requirements, • Focus on also creating employment opportunities for the youth and women. • Ensure safe and secure public transport access points. • Ensure effective safety and security measures.
Operational	Changes in Population Characteristics	Inflow of temporary workers	Socio-economic	None	• Maximise the usage of local service providers. • Use local workforce. • Ensure safe and secure public transport access points. • Implement education and skills development programmes to ensure an effective skills match between local people and mine requirements (seeing as the proposed mine is an open cast mine, whilst the labour force has experience on underground mining). • Focus on also creating employment opportunities for the youth and women.
Operational	Impact on community and institutional structures	Attitude formation	Socio-economic	Possible action group formation against mining activities in the area and focused actions against the mining company.	• Mining company should strive to achieve best practice Guidelines of EMPr should be strictly followed. • Ongoing and transparent communication with community leaders, landowners and spokespersons. • Possible establishment of a Management and Monitoring Committee consisting of representatives of the mining company (ECC DECM), Emalahleni Local Municipality, community leaders and landowners to monitor mining activities over the long term.
Operational	Impact on community and institutional structures	Impact on local municipality	Socio-economic	Economic benefits and spin-offs from proposed development and additional income base of Municipality.	• Determine the impact of the mining activities and expansion (positive and negative) on the financial and institutional resources of the Emalahleni Local Municipality. • Put pro-active measures in place to manage the additional pressure on the infrastructure and services as a result of the influx of additional permanent employees to the area. • Implement comprehensive traffic impact assessment.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
					• Ensure safe and secure public transport access points. • Implement access control. • Ensure effective safety and security measures. • Monitor the condition of local roads used as transport linkages. • Implement road maintenance and upgrade programmes in collaboration with the municipality. • Institute a joint municipal coordinating committee to support the municipal local economic and social develop needs and requirements, where feasible.
Operational	Impact on community and institutional structures	Impacts on infrastructure Development and maintenance	Socio-economic	Increased pressure on health and road infrastructure.	• Ensure that a proper emergency plan that fits with the municipal Disaster Management Plan is in place. Such a plan should be developed by the Emalahleni Local Municipality together with DCM. • DCM to pro-actively liaise with the Emalahleni Local Municipality regarding their additional infrastructural and housing requirements. • Additional electricity supply requirements should be fed into the Electricity Master Plan to ensure pro-active planning in this regard.
Operational	Impacts on Occupational and Community Resources	Economic Contribution and Revenue creation	Socio-economic	Regional economic spin-offs and benefits; Continued economic benefits for those businesses dependent on the mine and the employees' buying power (Ga-Nala).	• Local goods and services should be used as far as possible. • Implement contractual requirement for contractors to use local goods and services as far as possible.
Operational	Impacts on Occupational and Community Resources	Impact on Job Opportunities	Socio-economic	Ongoing purchasing power of those employed by the mine. Indirect benefits to businesses. Increased tax base for local municipality.	• The use of local labour should be maximised. • Ensure an equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account. • Skills development and training focused on the employees and youth should take place during the life of mine. • Skills training and capacity building programmes should be linked to the Emalahleni Municipality's Education and Training Skills Strategy. • Local SMME should be allowed the opportunity to become involved in e.g. maintenance, security services, garden services, cleaning and catering services, transport services and as input suppliers. • The existing skills base should be developed by providing all employees at DCM to become functionally literate and numerate. • Training should ensure that employees obtain portable skills that could be used in non-mining sectors once the life of mine has come to an end. • Employers should adhere to labour legislation and regulations; ensure fair labour practices; ensure an equitable process whereby minorities and previously disadvantaged individuals (women) are taken into account.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
Operational	Impacts on Occupational and Community Resources	Impact on Property values	Socio-economic	Indirect negative economic impacts on landowners affected by blasting. Possible housing shortage.	• Crack surveys should be undertaken on a continuous basis • Take care to implement the aspects indicated in the EMP, with a specific focus on water (surface and underground) and dust management) during the operational phase of the mine. • Implement a consistent and constructive communication process with adjacent landowners, to address issue and concerns before these becomes unmanageable.
Operational	Impacts on Occupational and Community Resources	Local Procurement	Socio-economic	Local Economic Development and Capacity Building	• Provide support and encouragement to small businesses in the area. • Continue to provide technical advise to small businesses in the area • Actively pursue local SMME links. • Provide opportunities for local businesses to become involve at the start of the procurement process and by allowing them to form part of the tender process.
Operational	Impacts on Occupational and Community Resources	Social Development and Social Services Support	Socio-economic	Improvement of livelihood, improved education facilities and general social development.	• Involvement in upliftment programmes should be done according to the needs identified as part of the IDP • Focus on the expansion of local economic development programmes (LED). • Implement a baseline study to determine LED opportunities. • Implement a regular and formalised consultation process with local government to ensure synergy between the mine's social development and LED focus and that of the local municipality.
Operational	Impacts on Occupational and Community Resources	Capacity Building and Skills Training	Socio-economic	Improving quality of life of employees and their families through the provision of capacity building and skills training programmes formalise and implement learnership programmes ensuring statutory compliance, recognition of prior learning and certification according to the SAQA process and requirements	• N/A
Operational	Individual, Community And Family Level Impacts	Impacts on daily living and movement patterns	Socio-economic	Further intrusion and sense of place impacts associated with other developments in the area. Possible impact of borrow pits required for additional roads.	• Frequent and ongoing monitoring of boreholes is critical to address the concerns with regards to the impact on the water quality and quantity. • Gravel roads should be sprayed to minimise dust creation. • Ensure effective consultation and cooperation with local law enforcement agencies to ensure legal and regulatory compliance. • Proactively inform municipality and local resident of roads closures and diversions. • Ensure access points comply with standards and are well marked and indicated.
Operational	Individual, Community And	Impact on Social Networks	Socio-economic	Indirect economic impacts if people would leave the area in search of land or employment.	• The use of local labour would mitigate possible social conflict between outsiders and existing residents.

Phase	Project Activity		Aspect	Potential Impact	Mitigation Measures
	Family Level Impacts				• Maximise the usage of local service providers, maintenance, etc. • Should the mine not continue, the negative psychological impact on the surrounding communities should be sensitively dealt with.
Operational	Individual, Community And Family Level Impacts	Health Impacts	Socio-economic	Environmental problems and subsequent health impacts due to mismanagement or disasters.	• Continue and extend the current HIV/AIDS awareness and support programmes. • Ensure effective monitoring of water (surface and underground) and air quality and ensure regulatory compliance.
Operational	Individual, Community And Family Level Impacts	Safety impacts	Socio-economic	Increase in accidents due to mining activity in the area.	• Access to the mining area should be controlled to avoid animals or people entering the area without authorisation. • Mining vehicles should be in good working order and be inspected regularly. • Mining vehicles should keep to speed limits and penalties for not adhering to the safety measures should be implemented. • Ensure safe and healthy working practices.
Operational	Individual, Community And Family Level Impacts	Impacts on daily living and movement patterns with regards to construction of railway line	Socio-economic	Further intrusion and sense of place impacts.	• Ensure that access routes are coordinated with adjacent farmers and maintained. • Ensure strict access control. • Inform adjacent landowners before any maintenance activities or access of the areas. • Ensure safe operating environment. • Adhere to safety requirements and regulations.

16 Summary of Specialist Reports

Numerous specialist impact assessments were undertaken for the proposed Project, as set out in Table 16-1. Separate specialist reports were compiled and have been attached as appendices to this report. The specialist input included the baseline environment, potential impacts and the recommended mitigation measures. Table 16-1 provides a summary of the key recommendations of the studies.

Table 16-1: Specialist Studies Undertaken for the DECM

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included

Soils, Land Use and Land Capability	• Reduce the risk of erosion, compaction, and the creation of preferential flow paths by re-vegetating exposed areas, maintaining linear infrastructure and culverts and installing sediment traps and erosion berms;
	• Rehabilitated areas must be fenced, and animals should be kept off the area until the vegetation is self-sustaining;
	• Runoff must be controlled and managed using proper stormwater management measures;
	• Restriction of vehicle movement over sensitive areas to reduce compaction;
	• Only the designated access routes are to be used to reduce any unnecessary compaction;
	• Deep rip compacted areas, cover with at least 300 mm of topsoil and revegetate;
	• If soil is polluted, treat the soil using in-situ bioremediation;
	• If in-situ treatment is not possible then the polluted soil must be classified according to the minimum requirements for the handling, classification, and disposal of hazardous material, and disposed at an appropriate, permitted or licensed disposal facility;
	• All vehicles and machines must be parked within hard park areas, and must be checked daily for fluid leaks;
	• Refuelling must take place on a sealed surface area away from soils to prevent seepage of hydrocarbons into the soil;
	• Place drip trays where vehicles or machinery leaks are occurring;
	• Fuel, grease, and oil spills should be remediated using a commercially available emergency clean up kits;
	• Any contractors on site must ensure that all employees are aware of the procedure for dealing with spills, and leaks, and undergo training on-site; and
	• Soil pollution monitoring after spills should be conducted at selected locations on the project site to detect any extreme levels of pollutants, including:
	  ◦ pH;
	  ◦ Cation Exchange Capacity (CEC);
	  ◦ Exchangeable acidity (cations);
	  ◦ Micronutrients;
	  ◦ Anions and Nitrates (NH4 + NO3);
	  ◦ Phosphorus (P) (Bray 1);
	  ◦ Electrical Conductivity (EC);
	  ◦ Carbon (Walkley Black);
		X - All recommendations have been considered and included in this report.	Appendix D

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	◦ Soil particle size distribution (Clay, Silt & Sand); and ◦ Potential Harmful Elements and heavy metals, including: Cadmium (Cd), Chromium (Cr), Nickel (Ni), Lead (Pb), Copper (Cu), Mercury (Hg), Zinc (Zn), Arsenic (As) and Selenium (Se). • Monitor the decant of Acid Mine Drainage (AMD), contamination and dewatering and implement management measures which include for example, an abstraction borehole placed down gradient of the decant point and reverse osmosis or neutralisation and electrolytic treatment using a WTP to get purified water for discharge to the natural environment or other beneficial uses (refer to Groundwater Impact Assessment, 2021).Fence off rehabilitated areas from livestock until vegetation has established. Follow a grazing plan to prevent overgrazing, trampling and erosion. • This will lead to improved soil fertility land capability; • Soil/Land Offset should form part of a biodiversity (wetland) Offset plan if one will be developed and implemented after the residual impacts have been determined.; and • Monitor the area for related impacts and report to authorities as soon as possible. If areas are unstable and hold a risk to animals and humans, the area should be fenced off.		
Fauna and Flora	• Toolbox talks regarding vehicle speed limits should be regularly implemented; and • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions; • Monitoring of alien invasive sprawl during the operation is recommended as the surrounding vegetation is relatively intact and free from alien invasive plants; • Vegetate stockpiles to prevent soil loss, organic material loss, erosion, and sedimentation. • An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been damaged and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present; • A Subsidence Risk Assessment should be undertaken; • Ensure a livestock management plan is enforced to prevent further degradations; and • After rehabilitation the area must be fenced, and animals (cattle) should be kept off the area until the vegetation is self-sustaining and established.	X - All recommendations have been considered and included in this report.	Appendix E
Wetlands	• 500 m Buffer around the wetlands, when not possible at least a 100 m buffer around the wetlands triggered by GN 704. The establishment of hydrophytic plants and facultative hydrophytes that are native to the area; • Improved vegetation cover and establish hydrophytic plants and facultative hydrophytes that are native to the area. Reduced risk of erosion and sedimentation;	X - All recommendations have been considered and included in this report.	Appendix F

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	• Reduced risk of erosion, compaction, and the creation of preferential flow paths. Maintain linear infrastructure; • Natural diffuse flow through the wetland and reduced the occurrence of channelization; • Reduced risk of erosion and sedimentation of downstream wetland areas by re-vegetation; • Employment of a protective vegetated buffer strip around the wetland; • Improved water quality and prevention of pollution; • Monitor decant of AMD and implement management measures which include or neutralisation and electrolytic treatment using a WTP to get purified water for discharge to the natural environment or other beneficial uses; Financial provision is made for the establishment of a Reverse Osmosis Water Treatment post mine closure to ensure that acid mine drainage water is treated and to discharge the treated water back into the natural environment; • Seal the shaft by placing concrete plugs as well as implement a monitoring plan to ensure no decant; • Stabilize the area and ensure the area is of no hazard to humans and animals. When the area is unstable, fence the area off and prevent access; • Subsidence areas tend to form wetlands and should be left (if stable), then to reshape and landscape the area; and • Monitor the area for related impacts and report to authorities as soon as possible. If areas are unstable and hold a risk to animals and humans, the area should be fenced off.		
Aquatics	Based on the results of the current study, the following actions have been recommended to allow for commencement of the proposed Project: • The non-perennial nature of the associated watercourses presents challenges in limiting the adequacy of the indices utilised for the REMP, therefore toxicity testing (screening-level) should be implemented for a minimum of three biological groups (i.e. algae, invertebrates, and fish) during the wet season periods. This however, should be coupled with the SASS5 technique and visual assessment of the watercourses. • A follow-up survey during the wet season should be undertaken as the current assessment was undertaken during the dry season survey. The developed Aquatic Biomonitoring Programme must be adopted on an annual basis after commencement of the Construction Phase of the Project. This programme should continue for the life of the Project and for at least three years post the closure Phase.	X - All recommendations have been considered and included in this report.	Appendix G
Hydropedology	The following recommendations are applicable within this hydropedological impact assessment: • Ongoing water quality monitoring of surface and groundwater monitoring is imperative during the life of mine to allow for early detection of potential contaminants that may cause unforeseen negative impacts on the receiving environment; • It is recommended that the proposed management actions in this study be implemented to ensure that the identified risks are mitigated;	X - All recommendations have been considered and included in this report.	Appendix H

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	• Concurrent rehabilitation, where possible, is recommended throughout the proposed mining to promote vegetation cover and to preserve the topography as much as practically possible for the best post mining land use; • Expansion into the wetlands and interflow soils should be avoided as far as practically possible; • A geotechnical investigation needs to be undertaken to ensure surface stability and to mitigate the potential risk of subsidence as a result of underground mining out of the coal seams within the DECM; • The discard wash plant will be placed on a Witbank soil, which is a shallow recharge hydrological soil type. Any runoff from the discard wash plant should be conveyed to the PCD through HDPE lined channels to prevent or minimise contamination of groundwater resources; and • Mined-out areas may be prone to subsidence, therefore, recommendations provided in the geotechnical report should be adhered to and adequately managed (ECC, 2021). It is essential that the ground is stabilized through the proposed bord and pillar mining method to stabilise the land and conserve the hydropedological recharge mechanisms as much as is practically possible.		
Surface water	The following is recommended to mitigate identified impacts: • Site preparation for the construction of infrastructure should be confined to the existing development footprint area to minimise disturbance of soils and the probability of sedimentation and siltation of the nearby watercourses; • Construction should be undertaken during the dry winter period to reduce sedimentation in nearby watercourses since there will be minimal to no occurrence of rainfall; • The footprint of proposed infrastructure should be kept within the already disturbed area as proposed, where it is automatically integrated into the existing storm water management plan. • All storage areas (fuels, paints, oils) used at the construction camp should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; • Ensure that runoff from dirty areas is being directed to the existing storm water management infrastructure and should not be allowed to flow into the watercourses, unless DWS discharge authorisation has been granted upon compliance with relevant effluent discharge standards as stipulated in the NWA; • Water quality monitoring should continue downstream and upstream of the mine site, and within all surface water circuits at the mine to detect any contamination arising from operational activities; • Servicing of vehicles and machinery should continue being conducted at designated, appropriately paved areas. All used oils should be disposed of by accredited vendors from the mine site; • Disposal of general and other forms of waste should continue to be done into clearly marked skip bins which are collected by approved contractors for final disposal to appropriate disposal sites;	X - All recommendations have been considered and included in this report.	Appendix I

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	• Disturbance of soils during infrastructure demolition should be restricted to relevant footprint areas; • Movement of machinery and vehicles during infrastructure demolition should be restricted to designated access roads to minimise the extent of soil disturbance; • Use of accredited contractors for removal or demolition of infrastructure during closure is recommended; this will reduce the risk of waste generation and accidental spillages; • Re-profiling and revegetation of disturbed landscapes post-closure should be conducted to facilitate free drainage as much as practically possible to support post-mining land use; and • If decant occurs post-closure, a Reverse Osmosis Water Treatment Plant should be used to treat the AMD decant to DWS compliance levels before the treated water is released into the natural environment. Financial provision is made annually for a Reverse Osmosis Water Treatment Plant for use post-closure to treat AMD decant (Lorenz van de Heaver 2021, pers. comm).		
Groundwater	The following recommendations are made, and should be included in the EMPr and EA: • The development of a closure water management plan that assesses the management of a critical water level to minimise contamination of the shallow weathered aquifer. This must be analysed in a financial model to further inform the most effective closure water management options. The groundwater model must be used as a management tool to inform this process; • Adhere to the mining footprint and avoid unnecessary impacts to areas not currently identified in the layout, progress the mining activities as quickly as possible, and cease dewatering activities as soon as possible after mining has been completed; • Proper rehabilitation of the open pits, including the installation of a proper cover that reduces recharge to these areas including a proper top-soil layer and vegetation; • Monitoring of groundwater abstraction volumes during operation and the rate of water level recovery in the backfilled open pits and the development of stage curves which will aid in water management during the Post-Closure Phase; • Update of the groundwater and surface water monitoring network, with frequent surface and groundwater quality monitoring for the operational phase, to continue into the post-closure phase, to be able to discern trends in surface water quality; • Updating of the geochemical assessment with additional samples from new mining areas and geochemical model update to asses expected long-term AMD formation; • Updating of the numerical model once every two years or after significant changes in mine schedules or closure plans, by using the measured water ingress and water levels to re-calibrate and refine the impact predictive scenario; and Options to prevent decant flow from the pits, such as pump and treat, or a pit lake, must be considered, and alternatives should compared and included in a closure plan.	X - All recommendations have been considered and included in this report.	Appendix J

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Air Quality	Based on the results presented in this report, the following recommendations should be applied once operation commences: • Revive the dustfall monitoring network and maintain the programme for the LoM; • Set up a continuous real-time air quality monitoring station to measure criteria particulate and gaseous pollutants; • Designate a qualified person to act as the EO to oversee implementation of mitigation measures and assess efficiency on a regular basis; • Ensure air quality information is incorporated into the environmental management information system and submit annual reports to the South African Atmospheric Emission Licensing & Inventory Portal (SAAELIP), as required by law; • Establish codes of practice for good housekeeping concerning dust management and mitigation, including regular appropriate restrictions on vehicle movements and speeds; • The enclosure of the crushing and screening circuit at the Discard Plant; • Use of mitigation equipment at the dryer exhaust at the Discard Plant; and Monitor the air quality management measures and information to ensure that adopted mitigation measures are sufficient to achieve current air quality standards at the Project area and nearby receptors.	X - All recommendations have been considered and included in this report.	Appendix K
Noise	The findings from the model predictions and the impact assessment ranking methodology have indicated negligible impacts on the nearby sensitive receivers. However, the implementation of mitigation measures during the different phases of the project is recommended. The aforementioned will result in emission reduction and a further decrease in anticipated noise impacts onsite and at the receivers. The implementation of a monitoring programme will also be imperative to managing future noise sources and impacts throughout the Project's life. Based on the findings detailed in this report and the appropriate implementation of noise mitigation, management and monitoring measures, it is therefore recommended that the proposed Project be authorized from a noise impact perspective.	X - All recommendations have been considered and included in this report.	Appendix L
Heritage	Considering the nature and the scope of the Project, the following recommendations must be implemented prior to the commencement of the Project: • ECC must avoid impacts to BGG-001 through an amendment of the proposed underground expansion area to implement a 100 m no-go buffer zone around the heritage resource; • ECC must develop and implement an HSMP to conserve BGG-001 *in situ*. Where ECC have developed such a management plan, this must be updated to include BGG-001; • Where Project design amendments are not feasible, ECC will need to embark on a consultation process to assess whether a GRP is feasible; • ECC must obtain a destruction permit in terms of Section 34 of the NHRA to demolish HST-001 prior to the commencement of the Project; and	X - All recommendations have been considered and included in this report.	Appendix M

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	• To mitigate against potential direct impacts against previously unidentified heritage resources and where ECC has not done so already, ECC must develop and implement a Chance Find Protocol (CFP) prior to the commencement of Project activities. This CFP must be approved by the HRAs prior to implementation.		
Traffic	It is recommended that the proposed expansion of the existing Dorstfontein East Coal Mine, near Kriel, in Mpumalanga, is supported from a traffic / transportation engineering perspective, provided that any upgrades be completed before the colliery commences with its additional operations, as set out / proposed in this report (and on **Drawings 21047/AL/01 & 21047/ID/01**) and to the relevant standards of the Mpumalanga Department of Public Works, Roads and Transport.	X - All recommendations have been considered and included in this report.	Appendix O
Socio-economic	Recommendations arising from this SIA can be grouped into three themes: • Stakeholder engagement; • Development and implementation of mitigation measures; and Updates to this SIA and to key stakeholder messaging.	X - All recommendations have been considered and included in this report.	Appendix P
Greenhouse Gas Emissions	It is recommended that the ECC should investigate the technical and financial feasibility of implementing emission-reduction initiatives associated with its Eskom purchased electricity consumption and mobile equipment. Recommendations include, amongst others, using solar and/or wind-powered electricity instead of Eskom purchased electricity and diesel-fuelled generators, and investigating on-site processes to identify potential areas for process optimisation, energy efficiency, and improved energy management, etc. More than 60% of the projected GHG emissions associated with the operational phase of the proposed project will be fugitive emissions of methane (CH_4). Mitigation through technological innovation is of paramount importance for the underground coal mining sector. It is therefore recommended that ECC implement one, or a combination of technologies which would contribute towards reducing CH_4 emissions from the underground coal mining activities. The following technologies could be investigated, and the most feasible and cost-effective option(s) should be identified: CH_4 flaring, methane purification, power generation using methane, production of methanol and carbon black, thermal flow, catalytic flow, and catalytic monolith reactor technologies, mine methane utilization in gas turbines, and/or Carbon trading. It is also recommended that a GHG Management Plan be prepared and implemented for ECC. The goal of the GHG Management Plan should be to achieve optimal economically sustainable energy and carbon savings. The GHG Management Plan should ideally include, *inter alia*, implementation of an energy and GHG emission management programme to assist with analysing and identifying opportunities at the operations to reduce energy consumption and GHG emissions, as well as measuring of GHG emissions on an annual basis.	X - All recommendations have been considered and included in this report.	Appendix Q
Rehabilitation and Closure	The following actions are recommended to improve the resolution of the closure cost estimate and to advance the rehabilitation and closure planning and implementation accuracy: • Specialist studies required to further inform the closure costs should be undertaken to improve the closure cost accuracy going forward, this includes contaminated land assessments and quantification of the demolition waste and waste classifications associated with the expansion area;	X - All recommendations have been considered and included in this report.	Appendix R

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	• Once the proposed infrastructure has been constructed the quantities applied in the CCA should be reassessed based on detailed designs for the expansion infrastructure, particularly the Discard Wash Plant; • Long-term water treatment management costs associated with the Seam 2 and Seam 4 extension areas have not been accounted for in this closure cost assessment and should be included in the closure costs for the entire operation once the expansion project has been approved; and The above will require an update of the geohydrological model for closure of the operation, predicted decant dates, decant flows and decant qualities should be updated and water management measures should be determined based on this information.		
Visual	The majority of human settlements that are within the greater modelled viewshed output regions are dispersed settlement holdings, who have a sense of place characterised by the regions surrounding open cast coal mines, so the anticipated impacts are not going to significantly alter the sense of place, especially because all of the proposed activities and surface infrastructure is within in an existing operational mining footprint. It is recommended that landform design principles be implemented for the design parameters of the various buildings and open pit extension which is designed at both streamlining the rehabilitation approach for the operation along with minimising the vertical offset / height to ensure that a lower visual impact to the surrounding environment. It is recommended that should the final design of the project differ in location and assumed heights significantly from this assessment, an update of the viewshed modelling be performed to quantitatively assess the anticipated visual impacts.	X - All recommendations have been considered and included in this report.	Appendix N

17 Environmental Impact Statement

17.1 Summary if the Key Findings of the Environmental Impact Assessment

The Environmental Impact Statement is utilised to summarise all the potential environmental impacts identified during each phase of the proposed Project. The significance of the impacts associated with the relevant Project phases, pre-mitigation and post-mitigation, is summarised in Table 15-1, above.

Negative impacts are to be expected with undertaking the proposed activities at the DECM as they will require direct environmental disturbance. The most significant negative impacts identified are associated with site clearing during the construction phase and general operational and maintenance activities during the operational phase which may result in soil erosion, soil compaction, topsoil loss, subsequent sedimentation of watercourses leading to water quality deterioration. The mining of coal by underground mining will result in groundwater contamination, decanting and subsidence.

No wetlands will be directly impacted by the surface infrastructure, however, the surface infrastructure falls within the 100 m and 500 m Zone of Regulation of the Pan and Hillslope Seep (fragmented) (HGM 1 and 7). It is highly recommended that water courses (wetlands and pans) be avoided and not impacted with at least 100 m zones of regulation buffers to any infrastructure and construction activities.

17.2 Final Site Map

The infrastructure layout plan on which this impact assessment is based is provided in Figure 5-1 above and appended as Plan 4 in Appendix B.

17.3 Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

The negative and positive impacts have been discussed in Section 13.1 of this report, Table 13-2. The proposed activities will have a considerable impact on the vegetation and associated habitat types present in the mining and infrastructure area. The key negative impacts include the loss of topsoil resources, soil erosion, loss of habitat, removal of protected species and subsequent sedimentation of freshwater systems from cleared areas as a result of construction site clearance as well as operational activities.

No wetlands will be directly impacted by the surface infrastructure, however, the surface infrastructure falls within the 100 m and 500 m Zone of Regulation of the Pan and Hillslope Seep (fragmented) (HGM 1 and 7).

Underground mining contains the risk of subsidence, dewatering, decanting and contamination which might impact the wetlands significantly. Mitigation and management measures have been proposed for each identified impact associated with the proposed activities.

The most crucial impacts associated with the proposed DECM Project include but are not limited to:

- Potential for water resource contamination;
- Changes to wetland health and biodiversity;
- Direct negative impacts to BGG-001;
- Dewatering and drying out of wetlands;
- Dust generation and reduction in ambient air quality; and
- Potential social impacts (i.e. change sense of place, impacts associated with impacts with community health, safety and security, increased competition for water resources, etc.).

The key positive impacts associated to the proposed DECM Project include but are not limited to:

- Social development as part of the SLP;
- Multiplier effects on the local and regional economy;
- Skills training; and
- Social investment in local communities.

18 Proposed Impact Management Objectives and the Impact Management Outcomes for Inclusion in the EMPR

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

19 Aspects for Inclusion as Conditions of Authorisation

The studies and impact assessment has been based on the proposed mine layout. Should there be any changes to the proposed project description, the adequacy and accuracy of the work may be affected, and additional work may be required to fill in the gaps.

The EAP and Specialist team will be required to review the mine infrastructure layout and provided opportunity to amend the respective impact assessments. The Applicant will amend the layout based on the outcomes of this impact assessment process. The full extent of the proposed DECM has been assessed to establish the environmental baseline. All the recommendation and outcomes of the specialist studies discussed in this report must be understood by the client and implemented.

20 Description of any Assumptions, Uncertainties and Gaps in Knowledge

This section highlights the assumptions, uncertainties, limitations and knowledge gaps relevant to the assessment and mitigation measures of the various specialist studies undertaken. Refer to Table 20-1 below.

Table 20-1: Specialist Studies Assumptions, Uncertainties, and Gaps

Specialist Study	**Assumptions, Uncertainties and Gaps**
Soil, Land Use, and Land Capability	• Soil characteristics and descriptions in the report for the Dorstfontein West area are supported by data obtained from the Soil Survey Report, 2017; • A total of 10 soil samples were collected on the proposed infrastructure area of the Dorstfontein East area; • The area surveyed and confirmed during a one-day site visit is based on the initial layout presented by Exxaro; • Land suited for crop production was assumed also to be suitable for other, less intensive uses such as pasture, natural grazing, forestry, and wildlife; • Soils are contiguous hence differentiation is not abrupt, and the transition zone cannot be completely captured during any given soil survey; and • The soils within the capability classes are similar only concerning the degree of limitations in soil used for agricultural purposes or concerning the impact on the soils when they are so used.
Fauna and Flora	• The fauna and flora study forms part of a larger EIA and should be read in conjunction with the EIA and other related specialist studies; • The Fauna and Flora Impact Assessment was conducted during April 2021. Furthermore, timing and brevity of the survey was not ideal and conducted at the end of the flowering season, hence some species may have been missed. Land access delayed the timing of the survey; • No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation. Any recommendations, statements, or conclusions drawn from or based on this report must cite or reference this report. Whenever such recommendations, statements or conclusions form part of the main report relating to the current investigation, this report must be included in its entirety.
Wetlands	The following limitations were encountered during this study:

<table>
<tr><th>Specialist Study</th><th>Assumptions, Uncertainties and Gaps</th></tr>
<tr><td></td><td>Findings, data analysis and the impact assessment are based on the wetland assessment completed in 2019, no updated wetland assessments were done by the author of this paper;
As some areas assessed during 2019 have been approved for mining, some discrepancies might occur with the wetland delineations and PES, EIS and ES scores;
2019 Assessment:
Access to some of the systems was limited due to the areas being on Mine property. The systems that were not verified during the field survey were scrutinised at a desktop level and have been demarcated as such for transparency; and
Wetlands situated within the 500 m zone of regulation were assessed on a desktop level with very limited ground-truthing and some discrepancies within this zone may occur.
This wetland study forms part of a larger EIA and should be read in conjunction with the EIA and other related specialist studies; and
Findings, recommendations, and conclusions provided in this report are based on the authors’ best scientific and professional knowledge and information available at the time of compilation. No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation. Any recommendations, statements, or conclusions drawn from or based on this report must cite or reference this report. Whenever such recommendations, statements or conclusions form part of the main report relating to the current investigation, this report must be included in its entirety.</td></tr>
<tr><td>Aquatics</td><td>The following limitations were made by the author at the time of writing:
To obtain a comprehensive understanding of the dynamics of the biota present within a watercourse (e.g. migratory pathways, seasonal prevalence, etc.), studies should include investigations conducted during different seasons, over a number of years and through extensive sampling efforts. However, it should be noted that considering the short timeframes associated with the Environmental Authorisation process, only a single field survey has been undertaken and as such, the conclusions were based on data collected, a literature review, and professional experience.</td></tr>
</table>

Specialist Study	Assumptions, Uncertainties and Gaps
	• Some of the constraints observed during the field assessment include: a malfunction of the dissolved oxygen meter; systems which lacked connectivity wherein sampling was undertaken in isolated pools; some of the sites were dry; and most of the freshwater systems in the area were representative of non-perennial systems. Undertaking an aquatic biodiversity assessment in non-flowing systems may have limited the adequacy of the indices utilised due to their dependency on flowing water. Findings presented in this report should be reviewed in collaboration with the surface water and wetland reports. • At the time of the impact assessment survey, the Dorstfontein West Operations were not part of the Proposed Project, thus did not form part of the current assessment. • The Western Tributary of the Olifants and the Steenkoolspruit tributary are not expected to be impacted by the proposed activities as the watershed appears to drain towards the north-east and as such, were not included in the assessment.
Surface Water	The following assumptions and calculations were made to develop and update the water and salt balance for the DECM operations: The RoM is 2 156 648 tons per annum as provided by the client (Personal Communication with Mr Lorenzo Van Den Heever, 2017). This tonnage was used to calculate the amount of interstitial moisture present in the coal product based on the following two assumptions: • The mined product is a hard coal containing approximately 53% carbon and less moisture (World Coal Institute, 2005). • Moisture in product was assumed to be 7 % of the RoM (Donahue and Rais, 2009).
Groundwater	The simulations presented here are based on the following assumptions: • For the geochemical assessment, it was assumed that the additional testing is mainly to verify the current composition of materials and will not require updating of the previous geochemical model; • The mining schedule and layout used during simulations are presented in Figure 5-2 and Figure 5-3; • The numerical model update is based on previous numerical modelling reports and available monitoring data; • The previous impact assessments from modelling exercises in 2016 and 2019 were considered to be correct. These assessments showed that the co-disposal facility and the operational opencasts are considered the main sources of contamination on-site, and

Specialist Study	Assumptions, Uncertainties and Gaps
	this report focussed on updating the infrastructure plans related to the proposed underground extension and co-disposal expansion. This was taken as main input for the model update; • Based on the existing groundwater models, and based on available groundwater level data, dewatering groundwater levels could be lowered over a relatively large area around the opencasts. However, it is not expected that the dewatering activities will impact negatively on the existing privately-owned boreholes though one spring may have been impacted upon during mining of underground Block AB. The effects on groundwater levels were considered to have a low impact on shallow groundwater levels and therefore dewatering of the underground mine was not included; and • Inputs for transient flow modelling were derived from values used in previous models in terms of seepage rates and concentrations, sulphate being the main contaminant used for modelling of contaminant plume movement. However, source input concentrations were based on geochemical dynamic testing and modelling.
Air Quality	The uncertainty associated with dispersion models.
Noise	• The construction phase is assumed to be carried out during daytime hours only (06:00-18:00); and • The modelling adopted a conservative worst-case scenario approach assuming that all activities for each phase are being carried out simultaneously.
Heritage	• At the time of the pre-disturbance survey, access was not possible for the entire proposed expansion area, as mining-related activities were ongoing above ground and this area was unsafe to access and survey; • Whilst every attempt was made to survey the extent of the site-specific study area[6] (considering the points above), this report does not present an exhaustive list of identified heritage resources. Overgrown vegetation limited visibility at the time of the pre-disturbance survey; and

Specialist Study	Assumptions, Uncertainties and Gaps
	• Archaeological and palaeontological resources commonly occur at subsurface levels. These types of resources cannot be adequately recorded or documented by assessors without destructive and intrusive methodologies and without the correct permits issued in terms of Section 35 of the NHRA.
Greenhouse Gas Emissions	The following assumptions apply to this GHG Inventory: • This GHG Inventory uses data and information that have been provided by ECC via Digby Wells. It is assumed that the data and information provided are correct; • GHG Inventory information on current and historic GHG emissions at the DECM were not available at the time of preparing this GHG Emissions Assessment Report, even though such information was requested from the client. This Report therefore only focusses on the proposed underground extensions to the mine, and does not include the existing operations, nor a comparison of the emissions associated with the existing and proposed operations; • It is assumed that the coal production numbers provided by the client is run-of-mine; • It is assumed that CH_4 gas is not planned to be flared as part of the underground mining extensions; and • Further assumptions relating to the quantification of GHGs are specified in GHG report and assumptions regarding the impact assessment are specified in GHG report. The limitations and exclusions that apply to this GHG Emissions Assessment are described in various sections of this report.
Rehabilitation and Closure	The closure costing assumptions and the site-specific rehabilitation and closure measures included are addressed in the Sections that follow. **General** • The closure costing addresses closure and demolition associated with the proposed infrastructure to be developed as part of the expansion project. Surface rehabilitation associated with infrastructure footprints is excluded from the CCA since this infrastructure is to be constructed on already disturbed land;

Specialist Study	Assumptions, Uncertainties and Gaps
	• It is assumed that third party contractors would be commissioned to establish on site (preliminary and general costs included) to undertaken the demolition activities; • Unless firm agreements with the next land users are in place, it is assumed that all infrastructure will be demolished and removed; • No discounting of potential value recovered from the sale of the plant, steel or other material removed from site is considered; and • The closure cost estimate is exclusive of VAT. **<u>Infrastructure</u>** • All quantities applied for infrastructure demolition were supplied by the Digby Wells GIS team, as per layout data supplied by Exxaro; • Detailed designs for the planned Discard Wash Plant were not available, and quantities associated with this plant will need to be updated once these become available. A multiplication factor of ten was applied to the Digby Wells steel demolition unit rate to ensure adequate provision is made for demolition of this plant, since steel quantities in tonnes are not yet available, and the only quantity available is the surface area of the Discard Wash Plant; • It was assumed that the containers will be mobile and moved off site by a third party contractor; and • It was assumed that all concrete foundations associated with steel buildings and containers will be 250 mm thick. **<u>Demolition Waste</u>** Disposal of demolition waste has not been included in this closure cost assessment and should be included once there is better resolution on the quantity and types of wastes requiring disposal at closure. Demolition waste disposal within the open pit or down the shafts is possible, but the waste will need to be screened prior to disposal to ensure it is inert, and this activity will require approval if it is not included in DECM’s EMPr. **<u>Mining Aspects</u>** • No rehabilitation costs were included for the discard dump, since this is an existing disturbance and does not form part of the expansion project;

Specialist Study	Assumptions, Uncertainties and Gaps
	• Allowance for rehabilitation of the highwall to be constructed has not been included in this closure cost assessment under the assumption that this cost will form part of the rehabilitation costs for Pit 2; and • Allowance for sealing access shafts to the underground workings in Pit 2 has not been included in this closure cost assessment, it is assumed that this cost will be included in the rehabilitation costs associated with Pit 2 in the closure liability for the entire DECM operation. Engineering designs related to the proposed shafts to be developed in Pit 2 are not available at this stage, therefore capping/ sealing requirements for the shafts will need to be confirmed once these designs have been completed. **General Surface Rehabilitation** • Allowance included for general surface rehabilitation associated with the infrastructure footprint areas was not accounted for, since the proposed infrastructure will be constructed on an already disturbed area; and • It is assumed surface rehabilitation of these areas is already included in the site wide closure cost liability for DECM. **Monitoring and Maintenance** • Surface and groundwater monitoring was accounted for over a ten year period on a bi-annual monitoring frequency; • It was assumed surface water monitoring would be undertaken at five monitoring locations associated with the expansion area; and • It was assumed groundwater monitoring would be undertaken at five monitoring boreholes and allowance was not included for the drilling of any new boreholes that may be required (particularly at the proposal Discard Wash Plant). **Additional Allowances** • Preliminary and Generals (P&Gs) were applied at 20% of the rehabilitation and demolition costs; and • Contingencies were applied at 15% of demolition and rehabilitation costs. **Residual Closure Costs** Residual closure costs such as post-closure subsidence monitoring and long-term water management costs associated with the proposed expansion were not included in this CCA. These costs should be included in the closure cost liability for the entire DECM operation once/ if this proposed expansion is approved.

Specialist Study	Assumptions, Uncertainties and Gaps
Heritage	• Whilst every attempt was made to obtain the latest available information, the reviewed literature does not represent an exhaustive list of information sources for the various study areas. • The pre-disturbance survey focused on the proposed infrastructure footprint area and did not re-assess heritage resources identified to date through any other assessments undertaken to inform the current authorisations. • At the time of the pre-disturbance survey, access was not possible for the entire proposed expansion area, as mining-related activities were ongoing above ground and this area was unsafe to access and survey, • Whilst every attempt was made to survey the extent of the site-specific study area (considering the points above), this report does not present an exhaustive list of identified heritage resources. Overgrown vegetation limited visibility at the time of the pre-disturbance survey. • Archaeological and palaeontological resources commonly occur at subsurface levels. These types of resources cannot be adequately recorded or documented by assessors without destructive and intrusive methodologies and without the correct permits issued in terms of Section 35 of the NHRA.
Visual	• At the time of the compilation of the report, the infrastructure heights associated with the project design were unavailable. To effectively model the potential visual impact, assumptions were drawn using existing UCD facilities as a baseline.

21 Reasoned Opinion as to whether the Proposed Activity Should or Should not be Authorised

21.1 Reasons Why the Activity Should be Authorised or Not

Various specialist studies were undertaken during the EIA Phase with the objective of identifying and weighing anticipated impacts and risks associated with the proposed activities. The findings of the impact assessment have shown that the DECM Project will have impacts on the receiving environment, namely, the loss of topsoil on cleared land, soil erosion, subsequent sedimentation of wetland and river systems and loss of habitats and protected species. The site is also characterised by ecologically sensitive areas, especially with regards to flora, fauna, and wetlands.

Based on the Red Data plant species search for the QDS 2629AB, no flora SCC occur in this particular QDS and historical studies done in the vicinity of the project area indicate that no floral SCC that is listed as protected under the Mpumalanga Nature Conservation Act and SANBI TSP occur in the project area.

The potential positive impacts of the proposed Project include the temporal employment creation, skills training, generation of wealth within the community and economy and potential community development through the implementation of the SLP. However, the positive impacts do not significantly offset the negative environmental impacts. Further to this, coal is an undesirable source of energy and is not in line with the Paris Agreement, however, Eskom and the national energy needs will be reliant on coal for power generation until feasible renewable alternatives are adequately implemented.

Based on the assessment of the impacts associated with the Project, it is concluded that the proposed DECM Project can be authorised, provided that the mitigation measures proposed herein are applied diligently and the infrastructure layout is reconsidered to avoid sensitive wetland areas.

21.2 Conditions that Must be Included in the Authorisation

All mitigation measures included in this EIA/EMP Report and the associated specialist studies should be conditions to the authorisation. All specialist recommendations have been captured in Table 16-1. Numerous specialist impact assessments were undertaken for the proposed Project, as set out in Table 16-1. Separate specialist reports were compiled and have been attached as appendices to this report. The specialist input included the baseline environment, potential impacts and the recommended mitigation measures. Table 16-1provides a summary of the key recommendations of the studies.

22 Period for which the Environmental Authorisation is Required

The proposed LoM for the Project will require Environmental Authorisation for a period of 14 years.

23 Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment report and the Environmental Management Programme report.

24 Financial Provision

The estimated financial provision for closure of DECM amounts to **R 18,378,859** (excl. VAT and including P&Gs and Contingencies at 20% and 15%, respectively**.** The closure cost estimate breakdown is included Table 24-1.

Table 24-1: Closure Cost Summary for the Proposed Dorstfontein East Expansion Project

	Digby Wells Environmental **Exxaro Central Coal (Pty) Ltd, Dorstfontein East Coal Mine, EXX5725 Revision: 0**
Area and Description	**Life of Mine 2034**
Infrastructure demolition	
Area 1: Dorstfontein East	R12,759,441
Sub-total	**R12,759,441**
Rehabilitation	
Area 1: Dorstfontein East	R0
Sub-total	**R0**
Total Demolition & Rehabilitation	**R12,759,441**
Monitoring and Maintenance	
Monitoring Costs (Groundwater and Surface water)	R1,153,614
Sub-total	**R1,153,614**
Preliminary and General (20%)	R2,551,888
Contingency (10%)	R1,913,916
Sub-total	**R4,465,804**
GRAND TOTAL	**R18,378,859**

24.1 Explain How the Aforesaid Amount was Derived

The following approach was applied in the estimation of the closure costs:

- Review supporting information supplied by the mine;
- Collate infrastructure quantities using GIS attribute data, as per the current infrastructure layout supplied by the mine;

- Input infrastructure attributes into the Digby Wells closure cost model, and include mine-related disturbance into the model;
- Compute the rehabilitation costs for all mine disturbances, based on a set of assumptions applied;
- Summarise the closure cost estimation outcomes; and
- Detail all assumptions applied to facilitate the closure cost estimate.

24.2 Battery Limits for Closure

The battery limits applied in the closure cost assessment for the proposed extension is listed below and further reflected in Figure 5-1 above:

- Portal ventilation fan;
- STP;
- WTP;
- Potable Water storage tank;
- Erikson Pond;
- A new 22 kV overhead powerline from the existing substation to a new 22 kV substation;
- RoM Stockpile conveyor at portal;
- Change house;
- Lamp room;
- Office;
- Clinic;
- Stores;
- Workshop area; and
- Coal discard processing plant.

24.3 Confirm that this amount can be provided for from operating expenditure

Provided that the proposed Project is approved, Dorstfontein East Coal Mine will provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

25 Specific Information Required by the Competent Authority

The sub-sections below provide additional information which should be considered by the competent authority for the Project. The impact on the socio-economic conditions and the potential impacts and risks on heritage resources are considered below.

25.1 Impact on the Socio-economic Conditions of any Directly Affected Person

The potential socio-economic impacts expected to arise as a result of the Project have been investigated and assessed in the SIA (Appendix P). The findings of this report take into consideration the project's proposed activities, location of the project, the status of the existing socio-economic environment, and the ultimate effect that the project will have on this environment. The pre- and post-mitigation ratings assigned to the various impacts discussed in the report are summarised in Table 25-1 below. A total of 11 socio-economic impacts were identified for the proposed Project, of which five were rated positive and six negative. It was found that the majority of impacts fall within ratings of minor positive and moderate negative.

Mitigation measures are expected to reduce the significance of negative impacts to acceptable levels, while positive will be enhance to maximise benefits to surrounding communities such as the sustainable development of the local economy.

Table 25-1: Summary of Socio-Economic Impacts

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Construction	Temporary employment creation	Socio-economic	Temporary economic injection through income, mostly on an individual or household level.	Negligible - positive	Minor - positive
Construction	Project-induced in-migration	Socio-economic	A temporary increase in certain segments of the population can place additional strain on housing and services.	Negligible - negative	Negligible negative
Operational	Long term employment creation	Socio-economic	Extended employment periods at the mine through the extension of the LoM.	Minor - positive	Minor - positive
Operational	Project-induced in-migration	Socio-economic	An increase in certain segments of the population can place additional strain on housing and services.	Minor – negative	Negligible – negative
Operational	Skills training	Socio-economic	As per the requirements of the SLP, the workforce and some of the local community will be upskilled in line with the mine's skills development plan.	Minor - positive	Moderate - positive
Operational	Social investment in local communities	Socio-economic	The mine is currently implementing mine community development projects and will continue to do so under this project that extends the LoM and the mine's SLP commitments.	Minor - positive	Minor - positive
Operational	Multiplier effects on the local and regional economy	Socio-economic	Through the expansion of the DEMC, direct and multiplier effects will continue for a further 14 years.	Minor - positive	Moderate - positive

Phase	Project Activity	Aspect	Impacts	Significance (Pre-Mitigation)	Significance (Post Mitigation)
Operational	Continuation in nuisance factors	Socio-economic	The extended LoM implies an extension and intensification of certain nuisance factors such as blasting, resulting in continued noise and dust pollution and other issues.	Minor - negative	Minor - negative
Operational	Continued competition over water resources	Socio-economic	Water is a scarce resource, and the expansion of the mine could further impact on this limited resource.	Minor - negative	Negligible - negative
Operational	Community health, safety, and security	Socio-economic	Continuation and expansion of mining activities will lead to a possible increase and continuation of impacts associated with community health, safety, and security.	Minor - negative	Negligible - negative
Closure	Post-closure monitoring and rehabilitation.	Socio-economic	Economic Contraction	Moderate - negative	Minor - negative

25.2 Impact on any National estate Referred to in Section 3(2) of the National Heritage Resources Act

The HIA (Appendix M) was completed as part of this Project. Potential impacts and risks on heritage resources were investigated and assessed, and where possible, mitigation measures were provided. Table 25-2 describes the heritage resources that were identified in the Project area. It was noted that the environment was disturbed through anthropogenic and animal activities.

The identified heritage resources include:

Table 25-2: Heritage Resources Identified on site

Site Name	Description
BGG-001	Burial ground of approximately 19 graves. These are marked through various dressings, including: cement fittings, brick fittings, possible laterite and stone and soil heaps, with or without headstones. Headstones consist of cement or a single upright stone or brick. Two headstones have legible inscriptions although only one has a legible date (1985). The burial ground had a fence at some time, but this is now in a state of disrepair.
HST-001	Remains of what appears to be a one-roomed structure built on a small platform / raised foundation. The structure has one door and no windows were present. The structure was made of stone and plaster. The structure is surrounded by four small rectangles made of brick – it would appear these are gardens.

26 Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act

This section is not applicable to the proposed Project.

Part B: Environmental Management Programme Report

1 Details of the EAP

Digby Wells has been appointed to undertake the EA Application and the IWULA processes, as well as the associated specialist studies and the required PPP for the proposed Project. The details of the EAP are contained in Table 1-1 below.

Table 1-1: Contact Details of the EAP

Company Name:	Digby Wells and Associates (South Africa) (Pty) Ltd
Name of Practitioner:	Kelly Tucker
Telephone:	+27 11 789 9495
Fax:	+27 11 789 9498
Email:	Kelly.Tucker@digbywells.com

2 Description of the ASPECTS of the Activity

The aspects of the activity as described in Section 5 of Part A are covered by the EMPr.

3 Composite Map

The composite maps shown in Figure 3-1 and Figure 3-2 depicts the surface and underground mining areas and environmental aspects assessed which informed the impact assessment.

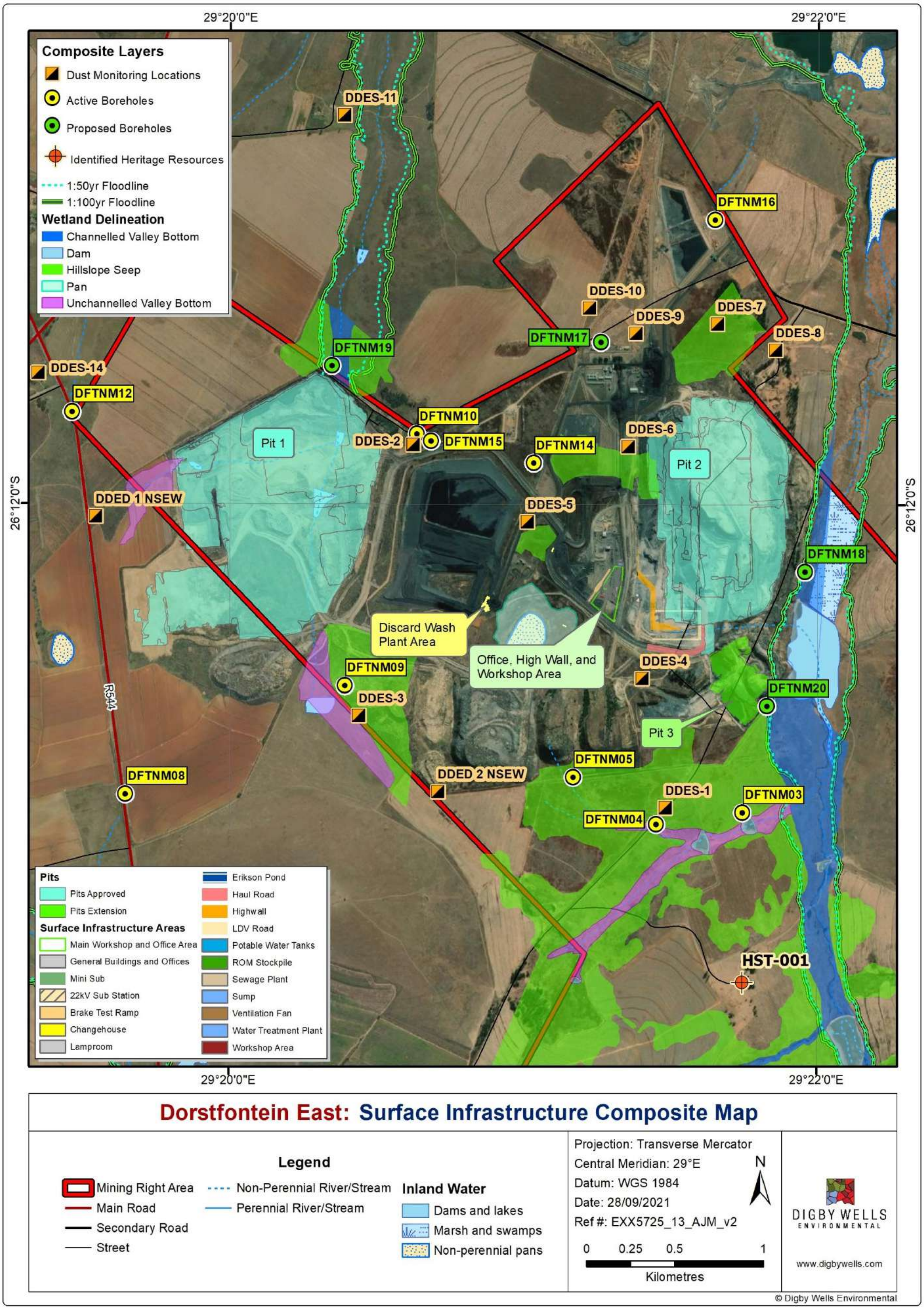


Figure 3-1: Surface Infrastructure Composite Map

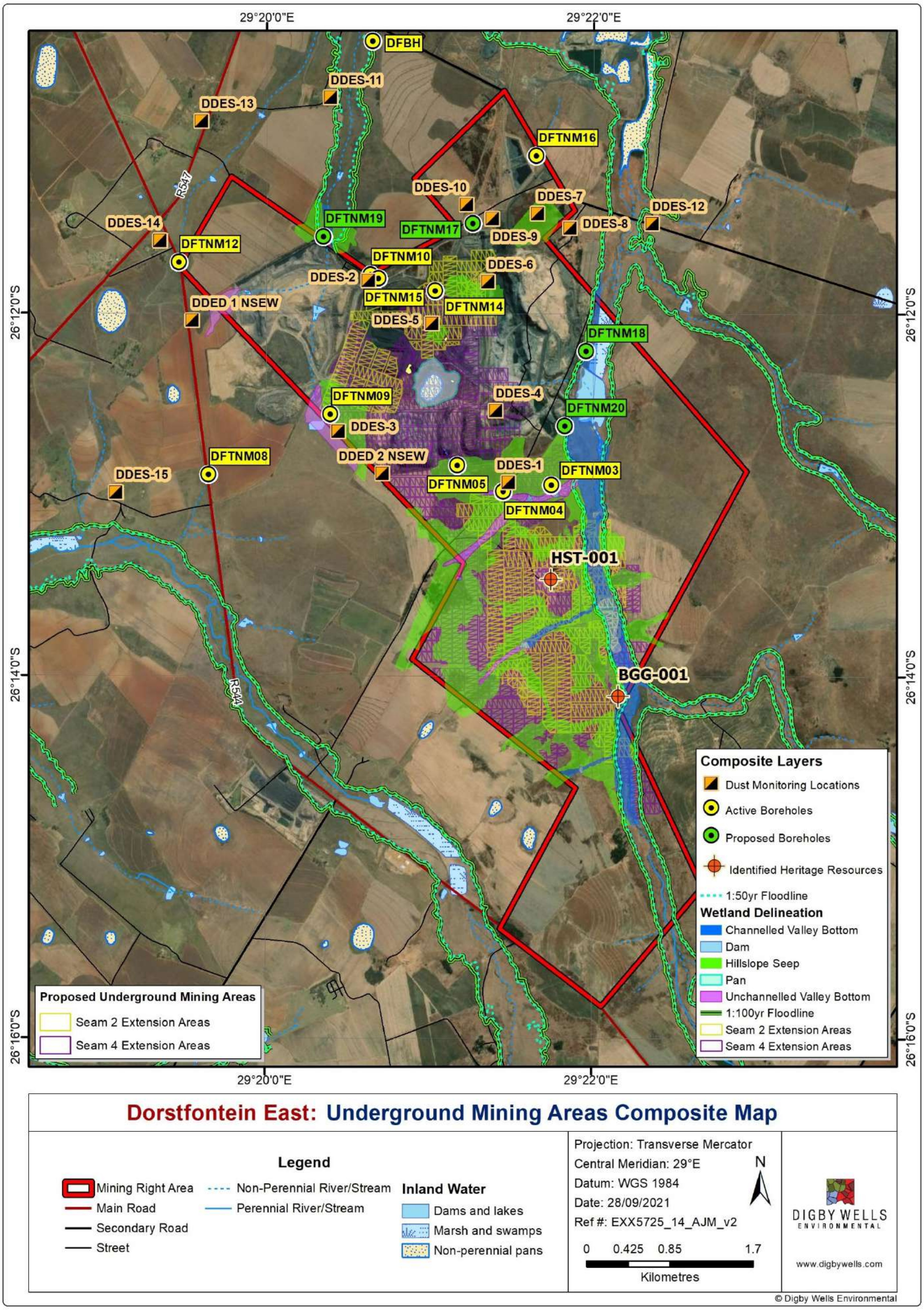


Figure 3-2: Underground Mining Areas Composite Map

4 Description of Impact Management Objectives Including Management Statements

The Closure and Rehabilitation Phases of the Project are important as their successful management aims to return the Project area, as much as possible, to its original state of environment. The following subsections describe the closure objectives, and the Emergency Response Plan.

4.1 Determination of Closure Objectives

Outlined below are specific objectives which support the overall closure vision and the closure measures developed:

- Return land disturbed by mining activities as far as possible to land capabilities similar to that which existed prior to mining;
- Ensure that contamination of surrounding areas by mine affected water is limited as far as possible, and that mine affected water is contained or treated post-closure;
- Remove mine infrastructure that cannot be used by a subsequent landowner or a third party. Where buildings can be used by a third party, arrangements will be made to ensure their long-term sustainable use;
- Clean up all stockpile footprint areas and loading areas and rehabilitate these areas to a land capability similar to that which existed prior to mining;
- Follow a process of closure that is progressive and integrated into the short and long term mine plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Rehabilitate the disturbed land to a state that facilitates compliance with applicable environmental quality objectives,
- Landscape the rehabilitated areas in alignment with the surrounding topography to prevent the unnecessary ponding of water and ensure all rehabilitated areas are free draining;
- Physically and chemically stabilise any remaining mining structures (i.e. discard dumps), where required, to minimise residual risk post-closure;
- Leave a safe and stable environment for both humans and animals;
- Prevent soil and surface/groundwater contamination by effectively managing water on site, and ensure clean/ dirty water separation is implemented during the operational period to minimise post-closure contamination potential;
- Comply with local and national regulatory requirements; and

- Ensure the Social and Labour Plan speaks to the closure plan and land use plan, and that social closure objectives (e.g. reskilling, retrenchment management, land use engagement etc.) are progressively met during the operational phase.

4.2 Volumes and Rate of Water Use Required for the Operation

The calculated annual and monthly water balances for the DECM are presented in Table 4-1and Table 4-2, respectively. The water balance indicates a water volume for dust suppression amounting to 344 032 m^3/annum and this water is obtained from Erickson Dams and the Mine Plant. Most of this water is used during the dry season where high levels of dust emissions are expected since rainfall will be minimal or absent. The largest amount of water at DECM circulates within the Erickson Dams 1, 2 & 3 with an approximate value of 1 352 260 m^3/annum. The RWD/PCD and Mine Plant follow in water usage, having average volumes of 1 086 045 m^3/annum and 968 466 m^3/annum, respectively. Potable water which is used at the Mine Offices, Workshop and Change houses totals 62 057 m^3/annum. This water, originally from Erickson Dams 1, 2 & 3, is treated at the WTP before being pumped for use at the workshop, offices and change houses.

4.3 Has a Water use Licence has been Applied for

ECC is in the process of applying for an IWUL from DWS as per the requirements in terms of the NWA. The Project infrastructure and activities trigger water uses in terms of Section 21 of the NWA and as such an IWUL is required.

Table 4-1: Annual average water balance for the DECM

Annual Average Water Balance for Dorstfontein East Coal Mine					
		Water In		Water Out	Balance
Facility Name	**Water Circuit/stream**	**Quantity (m^3/a)**	**Water Circuit/stream**	**Quantity (m^3/a)**	
Erickson Dams 1, 2 & 3			To: Evaporation	2 561	
	From: Rainfall	1 075	To: Mine Plant	964 435	
	From: TNC Mines (South32)	294 365	To: Water Treatment Plant	62 057	
	From: RWD/PCD	1 056 820	To: Dust Suppression	323 206	
	Total	**1 352 259.74**		**1 352 259.74**	-
Water Treatment Plant	From: Erickson Dams 1,2 & 3	62 057	To: Offices; Workshop & Changehouse	62 057	
	Total	**62 057.00**		**62 057.00**	-
Mine Plant			To: Co-Disposal Facility	876 099	
	From: Erickson Dams 1,2 & 3	964 435	To: Moisture in Product (Interstitial)	67 510	
	From: Runoff	4 031	To: Dust Suppression	20 826	
			To: Coal Stockpile Area	2 015	
			To: Railway Load Terminal (RLT)	2 015	
	Total	**968 465.60**		**968 465.60**	-
Co-Disposal Facility	From: Rainfall	81 637	To: Evaporation	194 570	
	From: Mine Plant	876 099	To: RWD/PCD	763 166	
	Total	**957 736.36**		**957 736.36**	-
RWD/PCD	From: Rainfall	51 035			
	From: Pit Dewatering (Pits 1,2 & 3)	15 684			
	From: Co-Disposal Facility	763 166	To: Evaporation	29 225	
	From: Overburden Stockpile	130 783	To: Erickson Dams 1,2 & 3	1 056 820	
	From: Coal Stockpile Area	69 526			
	From: Sewage Treatment Plant	55 851			
	Total	**1 086 045.11**		**1 086 045.11**	-
PCD (RLT)	From: Rainfall	5 510	To: Evaporation	7 818	
	From: Runoff (from RLT)	2 308			
	Total	**7 817.51**		**7 817.51**	-
Coal Stockpile Area	From: Mine Plant	67 510			
	From: Runoff (from Plant Area)	2 015	To: RWD/PCD	69 526	
	Total	**69 525.75**		**69 525.75**	-
Workshop; Offices and Changehouse			To: Consumption	6 206	
	From: Water Treatment Plant	62 057	To: Sewage Treatment Plant	55 851	
	Total	**62 057.00**		**62 057.00**	
Sewage Treatment Plant	From: Workshop; Offices & Changehouse	55 851	To: RWD/PCD	55 851	
	Total	**55 851.30**		**55 851.30**	-
Pit 1	From: Rainfall/Runoff	121 178	To: Evaporation	204 819	
	From: Groundwater inflow	228 900	To: Seepage/reacharge	140 031	
			To: RWD/PCD	5 228	
	Total	**350 077.83**		**350 077.83**	-
Pit 2	From: Rainfall/Runoff	7 339	To: Evaporation	64 213	
	From: Groundwater inflow	108 397	To: Seepage/reacharge	46 294	
			To: RWD/PCD	5 228	
	Total	**115 735.68**		**115 735.68**	-
Pit 3	From: Rainfall/Runoff	9 688	To: Evaporation	17 206	
	From: Groundwater inflow	27 701	To: Seepage/reacharge	14 956	
			To: RWD/PCD	5 228	
	Total	**37 389.39**		**37 389.39**	-
Overburden Stockpile	From: Rainfall/Runoff	160 147	To: Evaporation	29 364	
			To: RWD/PCD	130 783	
	Total	**160 147.27**		**160 147.27**	-
Total Water Balance		**5 285 165.54**		**5 285 165.54**	

Table 4-2: Monthly average water balance for the DECM

Monthly Average Water Balance for Dorstfontein East Coal Mine					
		Water In		Water Out	Balance
Facility Name	Water Circuit/stream	Quantity (m^3/mon)	Water Circuit/stream	Quantity (m^3/mon)	
Erickson Dams 1, 2 & 3			To: Evaporation	213	
	From: Rainfall	90	To: Mine Plant	80 370	
	From: TNC Mines (South32)	24 530	To: Water Treatment Plant	5 171	
	From: RWD/PCD	88 068	To: Dust Suppression	26 934	
	Total	**112 688.31**		**112 688.31**	-
Water Treatment Plant	From: Erickson Dams 1,2 & 3	5 171	To: Offices; Workshop & Changehouse	5 171	
	Total	**5 171.42**		**5 171.42**	-
Mine Plant			To: Co-Disposal Facility	73 008	
	From: Erickson Dams 1,2 & 3	80 370	To: Moisture in Product (Interstitial)	5 626	
	From: Runoff	336	To: Dust Suppression	1 735	
			To: Coal Stockpile Area	168	
			To: Railway Load Terminal (RLT)	168	
	Total	**80 705.47**		**80 705.47**	-
Co-Disposal Facility	From: Rainfall	6 803	To: Evaporation	16 214	
	From: Mine Plant	73 008	To: RWD/PCD	63 597	
	Total	**79 811.36**		**79 811.36**	-
RWD/PCD	From: Rainfall	4 253			
	From: Pit Dewatering (Pits 1,2 & 3)	1 307			
	From: Co-Disposal Facility	63 597	To: Evaporation	2 435	
	From: Overburden Stockpile	10 899	To: Erickson Dams 1,2 & 3	88 068	
	From: Coal Stockpile Area	5 794			
	From: Sewage Treatment Plant	4 654			
	Total	**90 503.76**		**90 503.76**	-
PCD (RLT)	From: Rainfall	459	To: Evaporation	651	
	From: Runoff (from RLT)	192			
	Total	**651.46**		**651.46**	-
Coal Stockpile Area	From: Mine Plant	5 626			
	From: Runoff (from Plant Area)	168	To: RWD/PCD	5 794	
	Total	**5 793.81**		**5 793.81**	-
Workshop; Offices and Changehouse			To: Consumption	517	
	From: Water Treatment Plant	5 171	To: Sewage Treatment Plant	4 654	
	Total				
Sewage Treatment Plant	From: Workshop; Offices & Changehouse	4 654	To: RWD/PCD	4 654	
	Total	**4 654.28**		**4 654.28**	-
Pit 1	From: Rainfall/Runoff	10 098	To: Evaporation	17 068	
	From: Groundwater inflow	19 075	To: Seepage/reacharge	11 669	
			To: RWD/PCD	436	
	Total	**29 173.15**		**29 173.15**	-
Pit 2	From: Rainfall/Runoff	612	To: Evaporation	5 351	
	From: Groundwater inflow	9 033	To: Seepage/reacharge	3 858	
			To: RWD/PCD	436	
	Total	**9 644.64**		**9 644.64**	-
Pit 3	From: Rainfall/Runoff	807	To: Evaporation	1 434	
	From: Groundwater inflow	2 308	To: Seepage/reacharge	1 246	
			To: RWD/PCD	436	
	Total	**3 115.78**		**3 115.78**	-
Overburden Stockpile	From: Rainfall/Runoff	13 346	To: Evaporation	2 447	
			To: RWD/PCD	10 899	
	Total	**13 345.61**		**13 345.61**	-
Total Water Balance		**435 259.04**		**435 259.04**	

5 Impacts to be Mitigated in their Respective Phases

The proposed mitigation measures and its compliance with the relevant standards are presented in Table 5-1.

Table 5-1: Impacts to be Mitigated in their Respective Phases

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
Construction	• Clearing of vegetation and/or soil for site establishment; • In-pit RoM Stockpiling; and • Access road construction	Soil, Land Use, and Land Capability	• Exposure of soil, increasing erosion potential and topsoil loss; • Compaction of soil; • Increased runoff potential; • Increased wind and water erosion and consequently sedimentation potential; • Removal of vegetation, basal cover and thus increasing the potential of loss of topsoil, organic material and increased erosion potential; and • Compaction, ponding, and landscaping of the area.	• Control site clearing to a minimal and restrict vehicle movement outside of dedicated areas, specifically close to wetlands (pans); • In-pit ROM Stockpiling should be allocated to areas with low agricultural potential areas and outside of wetland areas; • Make use of existing roads to encourage minimal impacts/footprint to the Project Area. It is advised that existing roads be updated before new roads are constructed; • During soil stripping, topsoil should be stockpiled separate from the subsoil to enhance the rehabilitation process; • While soils are being stockpiled, the soils should be revegetated to limit erosion and loss of organic material; • Establishment of effective vegetation around constructed infrastructure for adequate soil protection from wind and water erosion; • If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals or after high rainfall events; • Runoff must be controlled and managed by the use of proper stormwater management measures; • Vehicles should regularly be surveyed and checked that oils spills and other contaminants are not exposed to the soils; • Re-fuelling must take place on bunded impervious surfaces to prevent seepage of hydrocarbons into the soil; • All vehicles and machines must be parked within hard park areas and must be checked daily for fluid leaks; and • Fuel, grease, and oil spills should be remediated using a commercially available emergency clean up kits. However, for major spills (> 5L), if soils are	• Chamber of Mines Guidelines • NEMA; and • CARA.	Life of Construction Phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				contaminated, they must be stripped and disposed of at a licensed waste disposal site.		
Construction	• Diesel storage and explosives magazine • Construction of infrastructure, and ventilation Shafts. • Increased use of access road and haul roads • Stockpiling of soils, rock dump	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement. • Increased faunal casualties; and • Changes to the landscape, causing ponding and undulating topographies. • Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation. • Compaction of soils; • Low vegetation growth. If stockpiles unvegetated, potential erosion • Increased run off and erosion.	• All vehicles operating on the site should be regularly checked for hydrocarbon leaks; • Drip trays should be used during vehicle checks; • All refuelling and servicing should be undertaken within bunded designated areas to avoid hydrocarbons reaching the surrounding environment; • Toolbox talks regarding vehicle speed limits should be regularly implemented; • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions; • An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been damaged and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present; and • Dust suppression techniques should be implemented on all access and haul roads.	• NEMA; • NEM: PAA, as amended; • NFA; • NEM:BA • MPNCA; and NEM:BA.	Life of Construction Phase
Construction	• Site/vegetation clearance and site establishment (construction of surface infrastructure; and • In-pit RoM Stockpiling.	Wetlands	• Loss of fauna and flora (biodiversity); • Increased erosion and sedimentation; • Quantity and quality changes to the hydrological functioning; • Destruction or complete removal of wetland habitat; • Increased AIPs;	• If the destruction of wetlands is unavoidable disturbance must be minimised and suitably rehabilitated; • At areas where road crossings have been designed, these roads should cross wetland or river features at the narrowest point and a 90-degree angle with suitable drainage designed into the relevant bridge/culvert crossing; • Environmental Practitioner and botanist to be present during vegetation clearing to prevent unnecessary clearing of extensive areas not part of the direct footprint area; and	• NWA; • NEMB:BA; and • NEMA.	Life of Construction Phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
			• Fragmentation of wetlands and wetland habitat; • Sedimentation of downstream and adjacent wetlands; and • Soil and water contamination leading to wetland contamination.	• Bare land surfaces must be vegetated to limit erosion from surface runoff associated with infrastructure areas. Revegetate disturbed areas immediately after construction. • Stockpiles should be monitored to ensure no runoff, erosion and sedimentation into the adjacent areas, especially the wetlands and freshwater systems; • If spills have occurred, it should be cleaned up immediately; • RoM must be allocated to specific areas and stockpiled on hardened surfaces to prevent leaching of contaminants into the soil and groundwater; and • RoM stockpiles must be located outside wetlands and at least a 100 m buffer zone.		
Construction	Site clearing and infrastructure construction.	Aquatics	• Erosion and sedimentation • Altered hydrology.	• Limit the footprint area of the construction activities to what is essential in order to minimise impacts as a result of vegetation clearing and potential erosion areas; • If possible, construction activities must be prioritised to the dry months of the year to limit mobilisation of sediments, dust generation and hazardous substances from construction vehicles used during site clearing; • Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; and • An efficient drainage system (e.g. diversion trenches > settling area (or sump) > baffled discharge outlets) should be implemented prior to construction.	• NWA; • NEM:BA; • NEMA; and • National Freshwater Ecosystems Priority Areas (NFEPA, Nel et al., 2011).	Prior to construction activities are initiated
Construction	Construction activities, including vehicular activities and maintenance of access roads.	Aquatics	Water quality impairment	• Spillage management kits or controls should be taken seriously and put in place in order to reduce oil or fuel run offs to enter nearby river systems. • All vehicles must be frequently inspected for leaks; and • All waste must be removed and transported to appropriate waste facilities.		Ongoing throughout the Construction and Operational phases
Construction	• Construction of mining infrastructure including vegetation clearance, construction of	Hydropedology	• Disruption of flow paths • Soil erosion and compaction • Water quality degradation due to the use of	• Buffer zones need to be delineated and established as specified in the Wetlands report (Digby Wells , 2020) to prevent the destruction of wetlands within DECM; • Developments near undisturbed wetlands need to be avoided as much as possible;	• NEMA; and • NWA	During the construction phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
	access roads and associated infrastructure		hydrocarbons and other waste products.	• Rehabilitate the land to the most suitable post-mining land use; • The discard dump should be lined with an impermeable layer to prevent groundwater contamination; • Clearing of vegetation must be limited to the development footprint, and the use of any existing access roads must be prioritised to minimise creation of new ones; • Dust suppression on the haul roads and other cleared areas must be undertaken on regular basis to prevent or limit dust generation; • Hydrocarbon and hazardous waste storage facilities must be appropriately bunded to ensure that leakages can be contained. Spill kits should be in place and construction workers should be trained in the use of spill kits, to contain and immediately clean up any leakages or spills; • Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected daily before use to ensure there are no leakages underneath; and • Drip trays must be used to capture any oil leakages. Servicing of vehicles and machinery should be undertaken at designated hard park areas. Any used oil should be disposed of by accredited contractors.		
Construction	• Site/vegetation clearance for site establishment (infrastructure including ventilation fans, change houses, offices, ablutions, and workshops). • In-pit ROM Stockpiling. • Access road construction. • Construction of infrastructure.	Noise	Noise emission.	• Construction activities should be restricted to daylight hours; • Construction machinery and vehicles should be switched off when not in use; • Construction vehicles should have white noise reversing alarm (buzzer type reverse alarms) installed, rather than the conventional beeping type reverse alarms; • Vehicles to be serviced as per their design requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Regulate vehicle speeds on the access and haul roads.	Mitigation measures will assist in keeping noise levels as low as possible to comply with the National Noise Control Regulations.	Upon commencement of the construction phase.

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
Construction	• Site clearing; • Access and haul road construction; • Construction of surface infrastructure.	Air Quality	Poor air quality due to the generation of dust.	• Apply wetting agents, dust suppressants, and binders on exposed areas; • Limit activity to non-windy days (with wind speed ≤ 5.4 m/s); • Keep the area of disturbance to a minimum and avoid any unnecessary clearing, digging, or scraping, especially on windy days; • Minimise the drop heights when loading onto trucks and at tipping points; and • Set maximum speed limits and have these limits enforced.	• NEMA; • National Environmental Management: Air Quality Act, Act.39 of 2004, 2004; and • National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), National Dust Control Regulations (2013).	On commencement of the construction phase and for the duration of the phase
Construction	All Activities outlined in Appendix M.	Heritage	Damage to or destruction of previously unidentified heritage resources.	Develop and implement CFP.	National Heritage Resources Act No. 25 of 1999	Before the commencement of the Project.
Construction	• Site clearing Fencing	Socio-economic	Limited number of unskilled job opportunities could be offered to the local community.	• Advertise any local employment opportunities in local community papers and at venues frequented by community members (e.g., community hall, municipal offices, etc.). • Develop and maintain a database of job seekers who apply for any job advertised through the above-mentioned measures. • Do not employ at the gate. Employment at the gate of day labourers will stimulate an influx of job seekers and crowds gathering at the work site; and • Ensure that local communities are aware of and have easy access to the mine's grievance mechanism so that they can register complaints around employment practices. This will also allow the mine with opportunities to address any legitimate complaints.	• NEMA; • Employment Equity Act, 1997 (Act No. 75 of 1997); • Labour Relations Act 1995 (Act No. 66 of 1995); • Skills Development Act, 1998 (Act No. 97 of 1998).	Pre-construction and construction.
Construction	• Construction activities attract attention. People inform friends and family members of	Socio-economic	Project-induced in-migration can lead to the following socio-economic impacts where it occurs:	• Discourage in-migration from other areas by focusing employment opportunities at the local community and widely publicising this intent, and refrain from employing day labourers at the gate. Maintain a job seeker register and only employ people who are registered on this		Pre-construction and construction

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
	possible job opportunities. • Construction team mobilises.		• Increased demand for land to be used for informal housing. • Increased demand on the natural environment for resources such as wood for fuel. • Increased pressure on existing public infrastructure and services, such as communal toilet facilities, water standpipes, etc.; and • Possible increase in conflict situations over limited resources, including services such as water and sanitation, land, and employment opportunities.	database and who have been verified as being from the local area. • Engage with local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues related to in-migration.		
Construction	Economic activities associated with extended life of mine.	Socio-economic	• Longer term employment opportunities • Influx of people and job seekers • Skills training • Social investment opportunities in the local community • Multiplier effects on the local and regional economy	• Discourage in-migration from other areas by focusing employment opportunities at the local community and widely publicising this intent. • Communicate the mine's intent of utilising the existing workforce at the mine expansion rather than employing additional people. • Any new job opportunities should be offered only to those job seekers who have registered on the mine's database during the construction phase. • Engage with local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues related to in-migration. • Revise the DECM's Employment Policy where necessary with the objective of increasing local employment and transferring operational positions from migrant workers to people from within the study areas. • Prioritise local labour in the recruitment process as part of the DECM's employment policy or as part of a contractor management plan with the objective of recruiting 100% of any new or additional unskilled labour from local communities. • Develop a database of goods and services that could potentially be outsourced to the local community.		End of construction period, transitioning into operations, and life of mine

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Implement a contractor management plan (including direct service providers) in place to ensure that the local employment and procurement targets of the operation is met. The targets should be aligned to the Mining Charter 2018. • Ensure that the grievance mechanism is widely known and accessible to allow communities the opportunity to register complaints and have these addressed in a timeous manner. • Revise current SLP for the next 5-year cycle between 2022-2027 and include additional skills training programmes to ensure required skills are in place to support redeployment of workforce. • Identify skills deficiencies against requirements, performance management, succession planning, career structuring and operational equity plan and include appropriate training programmes in the new SLP cycle. Ensure that these aligned to the core skills areas of the mine and hard to fill vacancies. • Give preference to students for local communities for bursaries and internships. Advertise these in the local media. • Ensure mine community development projects are in line with identified projects in the IDP and decided on in consultation with relevant stakeholders (municipality, communities, etc). • Develop an updated mine community plan as part of an updated SLP for the project in consultation with relevant local stakeholders. • Ensure that the current allocation as per DECM's Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter 2018. • Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to the contractors and direct service providers). • Implement enhancement measures linked to employment creation and opportunities associated with the supply chain. • Implement SLP related interventions. • Compliance with SLP commitments to make maximum use of local SMMEs and BBBEE companies.		

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Implement grievance procedure.		
Construction	All construction, operational, and closure and closure phase activities associated with the DECM underground extensions project.	GHG	Impact on global climate change due to the emission of GHGs.	Prepare and implement a GHG Management Plan at Dorstfontein East Coal Mine. The GHG Management Plan should include, but not be limited to, the following: • An energy and GHG emission management programme to assist in analysing and identifying opportunities at the operations to reduce energy consumption and GHG emissions. This should include measuring GHG emissions on an annual basis, as is also required for the operational phase in terms of the Technical Guidelines and Section 8 of the IFC Performance Standard 3. • GHG emissions reduction projects and offsetting opportunities. • Allocated responsibility to a key employees(s) that will be responsible and accountable for managing and reporting on the GHG emissions performance of the project on an annual basis. • The GHG Management Plan should be updated regularly to ensure that the project complies with new South African policies and legislation relating to GHG emissions and climate change as it is promulgated.	NEMA	Construction, Operational and closure phase
Construction	Electricity use, and operation of mobile and stationary equipment on site.	GHG	Impact on global climate change due to the emission of GHGs.	Optimise the loading and operation of haul trucks to ensure optimal energy efficiency.	NEMA	Construction phase
Construction	Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.	Visual	Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.	• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • Make use of existing roads to encourage minimal impacts/footprint; • The footprint of the proposed mining operations should be limited to the extent of the infrastructure where possible.	NEMA	Construction Phase
Construction	Construction of Infrastructure	Visual	• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.	• All buildings and reflective surface must be limited in height and be painted natural hues to limit the extent and intensity of the visual impact. This is particularly relevant to the Discard Wash plant; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after	NEMA	Throughout LoM

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				construction or apply dust suppression techniques where applicable.		
Operational	• Blasting (only when dikes and other geological features are encountered); • In-pit RoM Stockpiling; • Underground Mining Machinery Maintenance; • Operation of water and sewer reticulation; • Use of existing haul roads; and Operation of the coal discard processing plant.	Soil, Land Use, and Land Capability	• Movement of the soil strata; • Potential subsistence, causing ponding and undulating topographies; • Soil Contamination; • Soil compaction; • Compaction of soil; • Increased runoff potential; • Increased erosion and consequently sedimentation potential; • Potential runoff from stockpiles causing imbalances to the soil chemical and physical state; • Erosion and sedimentation within the wetland areas; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; • Soil Contamination from Hydrocarbon waste (lubricants, explosives, and fuels); and • Soil contamination from sewage.	• Keep site clearing to a minimal and restrict vehicle movement outside of dedicated areas, specifically close to wetlands (pans); • Make use of existing roads to encourage minimal impacts/footprint to the Project Area; • It is advised that concurrent rehabilitation be done to minimize the impacts of the soils; • Soil pollution monitoring should be conducted at selected locations on the project site to detect any extreme levels of pollutants; • Any spillages of sewage effluent from the treatment plant or ablution facilities should be cleaned up immediately and the removed contaminated soils should be disposed of at accredited disposal sites; • Long term stockpiles should be revegetated to minimise loss of soil quality. This will minimise AIPs, maintain soil organic matter levels, maintain soil structure and microbial activity; • Topsoil stripping should be scheduled for the dry season, where possible; and • All long-term topsoil material stockpiles should be located outside the active mine path and away from drainage lines.	• Chamber of Mines Guidelines; • NEMA; and • CARA.	Life of Operational Phase
Operational	• Underground blasting and operation of the	Fauna and Flora	• Subsidence of areas that have been destabilised by underground workings;	• Consider areas with high flood areas and install regulated buffer zones to prevent mine inundation for the underground workings;	• NEMA; • NEM:BA; and • CITES.	Life of Operational Phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
	underground workings • Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas. • Infrastructure area, including stockpile areas and the discard dump • Storage, handling and treatment of hazardous products (including fuel, explosives and oil) and waste;		• Potential contamination of underground water and air; and • Increased risk of erosion. • Habitat disturbances and increased soil erosion, soil contamination and compaction. • Removal of soil and vegetation, increased faunal casualties (roadkill); • Increased erosion and sedimentation decreasing vegetation cover; • Dust pollution, and AIP proliferation; • Increased vehicle movement in the area, increasing soil compaction, and runoff potential; and • Unexpected changes in the topography and overall habitats. • AIP proliferation; • Animal/vehicle casualties and poaching; and • Erosion and sedimentation from the stockpiling and discards dumps. Contamination of soil, water and surrounding areas / habitats (pan vegetation) from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels).	• Adhere to all management and mitigation measures as prescribed within other specialist reports. • Undertake a subsidence risk assessment study to determine areas of high risk for subsidence and demarcate these areas after mining has taken place to minimise the risk if collapse for faunal species, as well as allow for the search and rescue of SCC flora that may be affected by the subsidence. • Avoidance of underground mining activities where high subsidence probability intersect with high sensitivity (CVB wetland) habitat. • Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment. This will be prudent in this development, since petroleum and other hydrocarbons associated with the trucks and vehicle-based activities are likely to be spilled in the environment if not managed well. Please refer to the Digby Wells Hydropedology Report (2021) for measures regarding this matter. • Monitoring of the vegetation communities present must be completed every 2 years to document to impacts of the edge effect and fragmentation; • Adhere to mine health and safety protocol regarding speed limits; • Monitoring of alien invasive sprawl during the operation is recommended as the surrounding vegetation is relatively intact and free from alien invasive plants; • Vegetate stockpiles to prevent soil loss, organic material loss, erosion, and sedimentation. • An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been damaged and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present; • Dust suppression techniques should be implemented on all access and haul roads;		

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Toolbox talks regarding vehicle speed limits should be regularly implemented; and • Training with regards to defensive driving to reduce the probability of vehicle/animal interactions.		
Operational	• Blasting (only when dykes and other geological features are encountered); • In-pit RoM Stockpiling; • Transportation of coal from pit for further processing; • Underground Mining Machinery Maintenance; • Operation of water and sewer reticulation; and • Use of existing haul roads.	Wetlands	• Movement of the strata causing potential subsistence, resulting in ponding and undulating topographies; and • Dewatering and drying out of wetlands. • Contamination and deterioration of water quality and quantity; and • Loss or changes to natural wetland integrity and biodiversity. • Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential into wetlands; • Wetland fragmentation; • Potential runoff from topsoil and subsoil stockpiles causing sedimentation into the wetlands; ; • Erosion and sedimentation of contaminants into the wetland areas; • Contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); • Contamination from sewage and wastewater; and • Contamination of soil, water and wetlands.	• All areas of high ecological sensitivity should be designated as “No-Go” areas and avoided; this include the CVB on the east boundary of the Project Area; • Freshwater resource monitoring must be carried out during the operational phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; • If it is unavoidable that any of the wetland areas present will be affected, the disturbance must be minimised and suitably rehabilitated; • A Storm Water Management Plan (SWMP) should already be implemented. This should consider wetlands associated with the new developments/infrastructure which should divert stormwater and runoff away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible; • All vehicle maintenance must occur within designated areas; • All vehicles must be regularly inspected for leaks; • All spills must be cleaned up immediately to prevent contaminants to enter the wetlands; • Re-fuelling and maintenance must take place on a sealed surface area away from wetlands to prevent the ingress of hydrocarbons into topsoil; • The edge of the wetland and a 100m buffer or 1:100 flood line buffer should be demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the operational phase; • All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off-limits to all unauthorised vehicles and personnel; • If it is unavoidable that any of the wetland areas present will be affected, the disturbance must be minimised and suitably rehabilitated;	• NEMA; • NWA; • NEM: BA; and • The Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP).	Life of Operational Phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• No material is to be dumped or stockpiled within any rivers, tributaries or drainage lines; • Culverts, roads and river crossings must be maintained, cleared and monitored; • No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas or their buffer areas. All vehicles must remain on demarcated roads and within the operational footprint; • Stockpiles should be monitored to ensure no runoff, erosion and sedimentation into the adjacent areas, especially the wetlands and freshwater systems; • ROM must be allocated to specific areas and stockpiled on hardened surfaces to prevent leaching of contaminants into the soil and groundwater; • ROM stockpiles must be located outside wetlands and at least a 100 m buffer zone; • A Storm Water Management Plan (SWMP) should already be implemented. This should consider all wetlands and other watercourses associated with the new developments/infrastructure which should divert stormwater and wastewater away from the surface infrastructure and back into natural watercourses to maintain catchment yield as far as possible. The SWMP should also convey contaminated water to silt traps to limit erosion and the subsequent increase of suspended solids in downstream watercourses; • Freshwater resource monitoring must be carried out during the operational phase by a wetland specialist to ensure no unnecessary impact to the freshwater resources present, and if so that a remedy is put in place as soon as possible; • Care must be taken to ensure that contamination of the receiving environment as a result of mining activities is minimised as far as possible; and • Chemicals, such as paints and hydrocarbons, should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions.		
Operational	Operational aspects of proposed Project.	Aquatics	• Erosion and sedimentation; • Water quality improvement/impairment	• Runoff from dirty areas should be directed to the storm water management infrastructure (drains and PCDs);	• NWA; • NEM:BA;	Ongoing

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• The aquatic biomonitoring program provided in this report should be adhered to for monitoring water resources within and in close proximity to the project area to allow detection of any contamination arising from operational activities; • The overall housekeeping and storm water system management (including the maintenance of berms, de-silting of dams and conveyance channels and clean-up of leaks) must be maintained throughout the life of mine; and • The hydrocarbon and chemical storage areas and facilities must be located on hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances; • Training of mine personnel and contractors in proper hydrocarbon and chemical waste handling procedures is recommended; • Vehicles must only be serviced within designated service bays; and • Wash bay and workshop runoff should flow through an oil separator as indicated on the infrastructure plan prior to discharge into the PCD.	• NEMA; and • NFEPA, Nel et al., 2011).	
Operational	Mine operational activities including blasting where necessary, use and maintenance of mining machinery.	Hydropedology	• Geotechnical instability as a result on mining out the underground coal seams may result in disruption of flow paths which feed downstream wetlands, and • Deteriorating water quality as a result of handling waste products and hydrocarbons associated with the proposed mining activities.	• The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to appropriate disposal sites; • The overall housekeeping and storm water system management (including the maintenance of berms, de-silting of dams and conveyance channels and clean-up of leaks) must be maintained throughout the LOM; • The hydrocarbon and chemical storage areas and facilities must be located on hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances; • Training of mine personnel and contractors in proper hydrocarbon and chemical waste handling procedures is recommended; and	• NEMA; and • NWA	Operational phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Vehicles must only be serviced within designated service bays.		
Operational	• Mining of coal by underground mining. • Blasting (only when dikes and other geological features are encountered). • In-pit RoM Stockpiling.. • Underground Mining Machinery Maintenance. • Operation of water and sewer reticulation. • Use of existing haul roads.	Noise	Noise emissions	• Machinery and vehicles used for maintenance work should be switched off when not in use; • Maintenance of existing berms on site; • Machinery and vehicles used for mining should be switched off when not in use; • Vehicles on site, should have white noise reversing alarm (buzzer type reverse alarms) installed, rather than the conventional beeping type reverse alarms; • Vehicles to be serviced as per their design requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Regulate vehicle speeds on the access and haul roads.		Upon commencement of the operational phase.
Operational	• Operation of the underground mining • In-pit RoM stockpiling • Loading, handling, and stockpiling of ROM ore • Operation of the ventilation shaft • Operation of the screening and crusher circuit	Air Quality	Poor air quality due to the generation of dust.	• Apply wetting agents, dust suppressants, and binders on exposed areas and haul roads; • Conduct mining activities judiciously on windy days (with wind speed ≥ 5.4 m/s); • Keep the area of disturbance to a minimum and avoid any unnecessary clearing, digging, or scraping, especially on windy days; • Minimise the drop heights when loading onto trucks and at tipping points; • The enclosure of the screening and crushing circuit, fitted with dust mitigation equipment; • Set maximum speed limits and have these limits enforced; and • Application of the mitigation equipment at the Discard Processing Plant dryer exhaust.	• NEM: AQA; and • National Ambient Air Quality Standards	Measurements must commence before the start of the operation phase and for the life of mine.
Operational	Daily mining activities giving rise to nuisance factors.	Socio-economic	• Dust and noise impact on health; • People movement impact on people's sense of safety and	**Health**: • Potential contamination of underground water resources due blasting activities; an issue which is commonly	• NEMA; • MPRDA; • Employment Equity Act, 1998	Operations

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
			security (perceived increase in crime); and • Impacts on people's water sources.	raised by mine communities in other areas where mining occurs. • Increased incidences of road traffic accidents between humans, livestock, and wildlife. Some small and large mammals roam freely in the primary study area and are often seen crossing the road; thus, increasing the potential road traffic accidents. • Unplanned spillage of dangerous goods during transportation to the Project area resulting in contamination of soils and waterbodies. • Potential increase in the transmission of communicable diseases, such as respiratory and sexually transmitted infections resulting from the influx of jobs and business seekers. • Consider mitigation measures identified in the relevant specialist studies (i.e. Air Quality, Ground and Surface Water). **Safety**: • Fly rock from blasting during construction may cause injury and / or death of people and livestock. • Dust from blasting and other Project activities may adversely impact humans, livestock, and wildlife. • Increased number of road traffic accidents – the project will have 194 heavy vehicles per week in the morning and night, respectively. • Damage to structures from vibrations caused by blasting or road traffic. • Injuries and / or fatalities involving community members entering hazardous, access-restricted areas on the construction or mine site and / or being exposed to hazardous materials related to the Project. • Decreased ambient air quality due to blasting, movement of vehicles, and site equipment and machinery. **Security**: • The increased movement of people in the area will result in increased incidences of livestock and game theft; and an increase in number of house break-ins. • Issues of community health, safety and security will be experienced in the are long after the mine has closed. This relates specifically to the following:	(Act No. 55 of 1998); • Skills Development Act (Act No. 97 of 1998 as amended); and • Company employment policies.	

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Some sexually transmitted diseases such as HIV/AIDs lead to permanent poor health outcomes and those affected may need long term care from others. • The risk of collapse of mine dumps owing to unplanned events such as floods and blasting from other activity mines in the area will remain in place. • Risks associated with children venturing into the closed mine putting their lives in danger will remain in place.		
Operational	Electricity use, and operation of mobile equipment and stationary equipment on site.	GHG	Impact on global climate change due to the emission of GHGs.	• Investigate the possible use of solar and/or wind-powered electricity to supplement Eskom purchased electricity and diesel-fuelled generators; • Investigate a payload management system or investigate options to improve the current system if such a system is already in place; • Implement a diesel energy-efficiency management programme; • Optimise the loading and operation of haul trucks and adjust haul truck engines to ensure optimal energy efficiency; • Investigate the use of biofuel as a fuel enhancer or partial fossil fuel substitute of the Project's diesel usage. Potential sources for biofuel could be used cooking oil (if available) or other vegetable oils such as palm oil, soybean oil, rapeseed oil or jatropha oil; and • Investigate the use of ethanol blends, as will be allowable in terms of the vehicles' warranty. Ethanol is less costly to produce than biodiesel due to lower feedstock costs. The most common feedstocks for ethanol in Africa are sugarcane and molasses.	NEMA	Operation
Operational	Fugitive CH4 emissions produced from underground coal mining, including emissions from activities after coal mining, such as coal transport and storage.	GHG	Impact on global climate change due to the emission of GHGs.	Implement one, or a combination, of the technologies which would contribute towards reducing CH4 emissions from the underground coal mining activities. The following technologies could be investigated, and the most feasible and cost-effective option(s) should be identified: • CH4 flaring, • Methane purification, • Power generation using methane,		

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Production of methanol and carbon black, • Thermal flow, catalytic flow, and catalytic monolith reactor technologies, • Mine methane utilization in gas turbines, and/or • Carbon trading.		
Operational	Operation of surface infrastructure (discard wash plant, workshop area, and related infrastructure)	Visual	• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.	• As far as possible, preserve the natural vegetation to reduce the visual impact; • Sensitive receptors should be mitigated from the visual impact by a strategic usage of tree-lines and on site berm features which integrate with effective landform design. • Buildings associated with the Discard Wash Plant, Workshop area and related infrastructure should be kept to a colour that does not bear a large contrast to the existing natural vegetation and landscape.	• NEMA; • NEM: PAA; and • NHRA.	Operational Phase
Operational	Extension of Pit 3	Visual	Larger footprint of existing pit, and potential dust pollution	• Visual screens be placed in the form of tree-lines, particularly in line of site of the eastern sensitive receptors within 5km		
Operational	Lighting of mine infrastructure at night	Visual	• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.	• Focus the lights towards components of the mine that require specific lighting to avoid light dispersal; • Consider utilizing lower lumen lighting that does now spill outside of the mine region.		
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation. • Rehabilitation – rehabilitation mainly consists of	Soil, Land Use, and Land Capability	• Compaction of soil; • Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology; • The proliferation of AIPs, changing the soil biodiversity and potential; • Disturbance of soils and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil	• Continue with Concurrent Rehabilitation and implement land rehabilitation measures; • Address compacted areas by deep ripping to loosen the soil and revegetate the area as soon as possible; • The backfilled, reprofiled landscape should be top soiled and revegetated to allow free drainage close to the pre-mining conditions; • Seal the shafts by placing concrete plugs as well as implement a monitoring plan to ensure no decant; • Inventory of hazardous waste materials that may be expected from the Project Area must be classified and should be disposed of in an appropriate landfill facility;	• Chamber of Mines Guidelines; • NEMA; and • CARA.	Life of closure and beyond

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
	spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation. Post-closure monitoring and rehabilitation.		compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; and • Ponding of water and creation of drainage channels; • Minimal negative impacts on the environment; • AIPs Monitoring Plan; and • Soil compaction and increased runoff potential due to vehicle movement during rehabilitation programs.	• Ensure proper stormwater management designs are in place to ensure no run-off or pooling occurs; • Implement a soil monitoring plan to monitor any changes to the soil and its environments, such as contamination, erosion, subsidence, surface cracking, AIPs, and soil health; • Monitor decant from the underground workings and implement management measures which include reverse osmosis or neutralization and electrolytic treatment using a Water Treatment Plant (WTP) to get purified water for discharge to the natural environment or for other beneficial uses; and • A rehabilitation and monitoring plan should be implemented for at least three (3) years after closure to ensure no unexpected and undulated impacts on the environment, Soil, Land Use, and Land Capability.		
Closure	• Demolition and removal of infrastructure • Post-closure monitoring and rehabilitation • Closure of the underground mine.	Fauna and Flora	• Disturbance of soils, and subsequent erosion by wind, and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape. • Exposure of soils, and subsequent compaction, erosion, and sedimentation; • Soil compaction, and increased runoff potential	• Continue with concurrent Rehabilitation, begin with stockpiles, bare grounds and dumps, implement rehabilitation measures; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible to prevent AIP sprawl; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; • Only designated access routes are to be used to reduce any unnecessary compaction; • During the closure phase, rehabilitation must start as soon as possible and preferably in the growing season (October to February) to ensure adequate plant recruitment; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; • Only designated access routes are to be used to reduce any unnecessary compaction; and • Ensure mitigations measures to prevent subsidence are enforced and maintained throughout the closure phase.	• NEM: BA; • NEMA • NEM: PAA (as amended); and • CARA.	Life of closure Phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
			due to vehicle movement during rehabilitation programs; • Loss of organic material, and vegetation cover; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of soil; and • Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats.			
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation of the final land rehabilitation; • Rehabilitation – rehabilitation mainly consists of spreading of the preserved subsoil and topsoil, profiling of the land and re-vegetation; and • Post-closure monitoring and rehabilitation.	Wetlands	• Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology of the wetlands; • The proliferation of AIPs; • Exposure of soils and subsequent compaction, erosion, and sedimentation into the wetlands; • Deterioration of water quality; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of wetlands. • Water and soil contamination; • Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use; and Decanting.	• Closure should occur in the dry season to avoid high rainfall events that could lead to increased runoff, erosion, contamination and sedimentation of the wetlands; • Stormwater must be diverted from decommissioning activities; • Stored mine-affected water should be treated before decommissioning of any mine-related water retention areas, such as PCDs and wastewater facilities; • The edge of the non-directly impacted freshwater resources, and at least a 100m buffer or 1:100 flood line buffer, should be demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the decommissioning phase; • All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off-limits to all unauthorised vehicles and personnel; • Actively landscape and re-vegetate disturbed areas as soon as possible to avoid loss of soil, organic material, and sedimentation into wetland areas; • Implement and maintain a Wetland and AIPs Plan for the duration of the decommissioning phase and into closure; • No material should be dumped/stockpiled within any wetlands or watercourses; • No vehicles or heavy machinery should be allowed to drive indiscriminately within any wetland areas or their	• NWA; • NEM:BA; and • NEMA	Life of closure and beyond

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				buffer areas. All vehicles must remain on demarcated roads; • Wetland monitoring must be carried out during the decommissioning phase into mine closure to ensure no unnecessary impact to wetlands takes place; • Decanting must be controlled by groundwater monitoring and by following the mitigation measures stipulated in the geohydrological report; • Rehabilitation must be done as soon as any impacts are observed; • Monitor decant of AMD and implement management measures which include in-situ passive treatment or neutralisation and electrolytic treatment using a WTP to get purified water for discharge to the natural environment or other beneficial uses; • Seal the shaft by placing concrete plugs as well as implement a monitoring plan to ensure no decant. • Newly shaped and topsoiled areas must be revegetated as soon as possible to prevent sedimentation and erosion.		
Closure	Demolition and removal of infrastructure; Rehabilitation and closure.	Aquatics	• Erosion and sedimentation • Altered hydrology; and • Restoration of the pre-mining streamflow regime in the associated watercourses.	• Restore the topography to pre-mining conditions as much as is practically possible; • Clearing of vegetation should be limited to the decommissioning footprint area and immediate revegetation of cleared areas; • Closure activities should be prioritized during dry months of the year where practical; • Disturbance of soils during infrastructure demolition should be restricted to relevant footprint areas; • Movement of demolition machinery and vehicles should be restricted to designated access roads to minimise the extent of soil disturbance; • Use of accredited contractors for removal or demolition of infrastructure during decommissioning is recommended; this will reduce the risk of waste generation and accidental spillages; • Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning; and	• NWA; • NEM:BA; and • NEMA.	During the closure phase And post- closure phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Capping, reprofiling and revegetation of TSF post-closure to limit the potential for future oxidation of stored tailings, and enable clean runoff to be discharged to the surrounding environment.		
Closure	Closure and removal of infrastructure.	Hydropedology	Contamination of receiving waterbodies	• Restore the topography to pre-mining conditions as much as is practically possible by backfilling, removing stockpiles and restore the slope gradient and angle of the site; • Immediate revegetation of cleared areas is recommended; • Decommissioning activities should be prioritized during dry months of the year (May to October) where practical; • All leaks and spillages should be cleaned as soon as possible and disposed of by accredited vendors; • Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; • The constructed stormwater management infrastructure should remain intact until post closure to ensure dirty water is captured and contained during removal of infrastructures; • Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before closure; • Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site; and • An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during the planned closure of the project.	• NEMA; and • NWA	During the closure and closure phases
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for	Noise	Noise emission	• Restrict closure activities to daylight hours; • Vehicles on site should have should have white noise reversing alarms (buzzer type reverse alarms) installed, rather than the conventional beeping type reverse alarms; • Regularly service machines and vehicles to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	SANS 10103.	Upon commencement of the closure phase.

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
	the final land rehabilitation. • Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation. • Post-closure monitoring and rehabilitation.			• Regulate speed limits on access roads; and • Switch off equipment when not in use.		
Closure	• Dismantling and removal of infrastructure • Rehabilitation of the Project area • Post-closure monitoring and rehabilitation	Air Quality	Poor air quality due to the generation of dust.	• Apply wetting agents, dust suppressants, and binders on exposed areas; • Conduct mining activities judiciously on windy days (with wind speed ≥ 5.4 m/s); • Keep the area of disturbance to a minimum and avoid any unnecessary clearing, digging, or scraping, especially on windy days; • Minimise the drop heights when loading onto trucks and at tipping points; • Set maximum speed limits and have these limits enforced; • The dismantling of infrastructure must occur in phases; and • The rehabilitated landscape should be vegetated.	• NEM: AQA and • National Ambient Air Quality Standards.	On commencement of the closure phase and for the duration of the phase
Closure	Mine closure	Socio-economic	Loss of employment	• Develop and implement an integrated Mine Closure Plan. • Proactively assess and manage the social and economic impacts on individuals, regions, and economies where retrenchment and/or closure of the Project are certain.	NEMA.	Towards end of LoM, care and maintenance, closure.
Closure	Electricity use, and operation of mobile and stationary equipment on site.	GHG	Impact on global climate change due to the emission of GHGs.	• As far as possible, use solar and/or wind-powered electricity as supplemental options instead of fully relying on purchased electricity and diesel-fuelled generators; • Investigate a payload management system or investigate options to improve the current system if such a system is already in place;	NEMA	closure and closure phase

Phase	Project Activity	Aspect	Impacts	Mitigation Measures	Compliance with standards	Time period for implementation
				• Implement a diesel energy-efficiency management programme; • Optimise the loading of haul trucks to ensure optimal energy efficiency; • Investigate the use of biofuel as a fuel enhancer or partial fossil fuel substitute of the Project's diesel usage. Potential sources for biofuel could be used cooking oil (if available) or other vegetable oils such as palm oil, soybean oil, rapeseed oil or jatropha oil; and • Investigate the use of ethanol blends, as will be allowable in terms of the vehicles' warranty. Ethanol is less costly to produce than biodiesel due to lower feedstock costs. The most common feedstocks for ethanol in Africa are sugarcane and molasses.		

6 Impact Management Outcomes

Table 6-1 provides a description of impact management outcomes, identifying the standard of impact management required for the aspects.

Table 6-1: Impacts to be Mitigated in their Respective Phases

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
Construction	• Clearing of vegetation and/or soil for site establishment; • In-pit RoM Stockpiling; and • Access road construction	Soil, Land Use, and Land Capability	• Exposure of soil, increasing erosion potential and topsoil loss; • Compaction of soil; • Increased runoff potential; • Increased wind and water erosion and consequently sedimentation potential; • Removal of vegetation, basal cover and thus increasing the potential of loss of topsoil, organic material and increased erosion potential; and • Compaction, ponding, and landscaping of the area.	***Modify, remedy, control, or stop*** Concurrent rehabilitation through the life of mine, where applicable	• Chamber of Mines Guidelines • NEMA; and • CARA.
Construction	• Diesel storage and explosives magazine • Construction of infrastructure, and ventilation Shafts. • Increased use of access road and haul roads • Stockpiling of soils, rock dump.	Fauna and Flora	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; and • Increased vehicle movement. • Increased faunal casualties; and • Changes to the landscape, causing ponding and undulating topographies. • Dust pollution, soil erosion, compaction, sedimentation and AIP proliferation and faunal casualties; • Increased vehicle movement promoting potential faunal causalities; and • Increased compaction and sedimentation. • Compaction of soils; • Low vegetation growth. If stockpiles unvegetated, potential erosion; • Increased run off and erosion.	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine	• NEMA; • NEM: PAA, as amended; • NFA; • NEM:BA • MPNCA; and • NEMBA
Construction	• Site/vegetation clearance and site establishment (construction of surface infrastructure; and • In-pit RoM Stockpiling.	Wetlands	• Loss of fauna and flora (biodiversity); • Increased erosion and sedimentation; • Quantity and quality changes to the hydrological functioning;	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine.	• NWA; • NEMB:BA; and • NEMA.

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
			• Destruction or complete removal of wetland habitat; • Increased AIPs; • Fragmentation of wetlands and wetland habitat; • Sedimentation of downstream and adjacent wetlands; and • Soil and water contamination leading to wetland contamination.		
Construction	Site clearing and infrastructure construction.	Aquatics	• Erosion and sedimentation • Altered hydrology.	*Modify* through construction site planning C*ontrol* through stormwater management and sediment containment infrastructure.	• NWA; • NEM:BA; • NEMA; and • NFEPA.
Construction	Construction activities, including vehicular activities and maintenance of access roads.	Aquatics	Water quality impairment	*Control* through driving access permits and permit areas and ongoing maintenance.	
Construction	Construction of mining infrastructure including vegetation clearance, construction of access roads and associated infrastructure	Hydropedology	• Disruption of flow paths • Soil erosion and compaction • Water quality degradation due to the use of hydrocarbons and other waste products.	Control the impacts within the DECM by implementation of the proposed mitigation measures during the construction and site establishment phases.	NEMA; NWA
Construction	• Site/vegetation clearance for site establishment (infrastructure including ventilation fans, change houses, offices, ablutions, and workshops). • In-pit ROM Stockpiling. • Access road construction. • Construction of infrastructure.	Noise	Noise emission.	Noise control measures; and Noise monitoring.	Mitigation measures will assist in keeping noise levels as low as possible to comply with the National Noise Control Regulations.
Construction	• Site clearing; • Access and haul road construction; • Construction of surface infrastructure.	Air Quality	Poor air quality due to the generation of dust.	• Control through the implementation of an air quality management plan; • Dust control measures; and • Ambient air quality monitoring	• NEM: AQA and • National Ambient Air Quality Standards
Construction	All Activities outlined in Appendix M.	Heritage	Damage to or destruction of previously unidentified heritage resources.	Control	National Heritage Resources Act No. 25 of 1999
Construction	• Site clearing • Fencing	Socio-economic	Limited number of unskilled job opportunities could be offered to the local community.	Control	• NEMA;

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
					• Employment Equity Act, 1997 (Act No. 75 of 1997); • Labour Relations Act 1995 (Act No. 66 of 1995); • Skills Development Act, 1998 (Act No. 97 of 1998).
Construction	• Construction activities attract attention. People inform friends and family members of possible job opportunities. • Construction team mobilises.	Socio-economic	Project-induced in-migration can lead to the following socio-economic impacts where it occurs: • Increased demand for land to be used for informal housing. • Increased demand on the natural environment for resources such as wood for fuel. • Increased pressure on existing public infrastructure and services, such as communal toilet facilities, water standpipes, etc.; and • Possible increase in conflict situations over limited resources, including services such as water and sanitation, land, and employment opportunities.	Stop influx by preventing influx.	• NEMA; • Employment Equity Act, 1997 (Act No. 75 of 1997); • Labour Relations Act 1995 (Act No. 66 of 1995); and • Skills Development Act, 1998 (Act No. 97 of 1998).
Construction	Economic activities associated with extended life of mine.	Socio-economic	• Longer term employment opportunities • Influx of people and job seekers • Skills training • Social investment opportunities in the local community • Multiplier effects on the local and regional economy	Control	
Construction	All construction, operational, and closure phase activities associated with the DECM underground extensions project.	GHG	Impact on global climate change due to the emission of GHGs.	Control	NEMA
Construction	Electricity use, and operation of mobile and stationary equipment on site.	GHG	Impact on global climate change due to the emission of GHGs.	Control	NEMA
Operational	• Blasting (only when dikes and other geological features are encountered); • In-pit RoM Stockpiling;	Soil, Land Use, and Land Capability	• Movement of the soil strata; • Potential subsistence, causing ponding and undulating topographies; • Soil Contamination;	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine	• Chamber of Mines Guidelines; • NEMA; and • CARA.

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
	• Underground Mining Machinery Maintenance; • Operation of water and sewer reticulation; • Use of existing haul roads; and • Operation of the coal discard processing plant.		• Soil compaction; • Compaction of soil; • Increased runoff potential; • Increased erosion and consequently sedimentation potential; • Potential runoff from stockpiles causing imbalances to the soil chemical and physical state; • Erosion and sedimentation within the wetland areas; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; • Soil Contamination from Hydrocarbon waste (lubricants, explosives, and fuels); and • Soil contamination from sewage.		
Operational	• Underground blasting and operation of the underground workings • Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas. • Infrastructure area, including stockpile areas and the discard dump • Storage, handling and treatment of hazardous products (including fuel, explosives and oil) and waste;	Fauna and Flora	• Subsidence of areas that have been destabilised by underground workings; • Potential contamination of underground water and air; and • Increased risk of erosion. • Habitat disturbances and increased soil erosion, soil contamination and compaction. • Removal of soil and vegetation, increased faunal casualties (roadkill); • Increased erosion and sedimentation decreasing vegetation cover; • Dust pollution, and AIP proliferation; • Increased vehicle movement in the area, increasing soil compaction, and runoff potential; and • Unexpected changes in the topography and overall habitats.	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine.	• NEMA; • NEM:BA; and • CITES.

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
			• AIP proliferation; • Animal/vehicle casualties and poaching; and • Erosion and sedimentation from the stockpiling and discards dumps. Contamination of soil, water and surrounding areas / habitats (pan vegetation) from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels).		
Operational	• Blasting (only when dykes and other geological features are encountered); • In-pit RoM Stockpiling; • Transportation of coal from pit for further processing; • Underground Mining Machinery Maintenance; • Operation of water and sewer reticulation; and • Use of existing haul roads.	Wetlands	• Movement of the strata causing potential subsistence, resulting in ponding and undulating topographies; and • Dewatering and drying out of wetlands. • Contamination and deterioration of water quality and quantity; and • Loss or changes to natural wetland integrity and biodiversity. • Head cut erosion and channel forming from the roads (culverts); and • Increased erosion and consequently sedimentation potential into wetlands; • Wetland fragmentation; • Potential runoff from topsoil and subsoil stockpiles causing sedimentation into the wetlands; • Erosion and sedimentation of contaminants into the wetland areas; • Contamination from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels); • Contamination from sewage and wastewater; and • Contamination of soil, water and wetlands.	*Modify, remedy, control, or stop*	• NEMA; • NWA; • NEM: BA; • NFEPA, Nel et al..; and • the Ramsar Convention and the SAWCP.
Operational	Operational aspects of proposed Project.	Aquatics	• Erosion and sedimentation, • Water quality improvement/impairment	*Control* through inspection and monitoring, as well as stormwater management and sediment containment infrastructure.	• NEMA; • NWA; • NEM: BA; • NFEPA, Nel et al

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
Operational	Mine operational activities including blasting where necessary, use and maintenance of mining machinery.	Hydropedology	• Geotechnical instability as a result on mining out the underground coal seams may result in disruption of flow paths which feed downstream wetlands, and • Deteriorating water quality as a result of handling waste products and hydrocarbons associated with the proposed mining activities.	Control the impacts within the DECM by implementation of the proposed mitigation measures during the operational phase.	• NEMA; and • NWA
Operational	• Mining of coal by underground mining. • Blasting (only when dikes and other geological features are encountered). • In-pit RoM Stockpiling.. • Underground Mining Machinery Maintenance. • Operation of water and sewer reticulation. • Use of existing haul roads.	Noise	Noise emissions	Noise control measures; and Noise monitoring.	National Noise Control Regulations.
Operational	• Operation of the underground mining • In-pit RoM stockpiling • Loading, handling, and stockpiling of ROM ore • Operation of the ventilation shaft • Operation of the screening and crusher circuit	Air Quality	Poor air quality due to the generation of dust.	• Control through the implementation of an air quality management plan; • Dust control equipment; and • Ambient air quality monitoring.	• NEM: AQA and • National Ambient Air Quality Standards
Operational	Daily mining activities giving rise to nuisance factors.	Socio-economic	• Dust and noise impact on health; • People movement impact on people's sense of safety and security (perceived increase in crime); and • Impacts on people's water sources.	Control	• NEMA; • Employment Equity Act, 1997 (Act No. 75 of 1997); • Labour Relations Act 1995 (Act No. 66 of 1995); and • Skills Development Act, 1998 (Act No. 97 of 1998).
Operational	Fugitive CH_4 emissions produced from underground coal mining, including emissions from activities after coal mining, such as coal transport and storage	GHG	Impact on global climate change due to the emission of GHGs.	Control	NEMA

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation. • Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation. Post-closure monitoring and rehabilitation.	Soil, Land Use, and Land Capability	• Compaction of soil; • Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology; • The proliferation of AIPs, changing the soil biodiversity and potential; • Disturbance of soils and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil compaction and runoff potential; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils; • Unexpected changes in the depth and the nature of the soil; and • Ponding of water and creation of drainage channels; • Minimal negative impacts on the environment; • AIPs Monitoring Plan; and • Soil compaction and increased runoff potential due to vehicle movement during rehabilitation programs.	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine	• Chamber of Mines Guidelines; • NEMA; and • CARA.
Closure	• Demolition and removal of infrastructure • Post-closure monitoring and rehabilitation • Closure of the underground mine.	Fauna and Flora	• Disturbance of soils, and subsequent erosion by wind, and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape. • Exposure of soils, and subsequent compaction, erosion, and sedimentation; • Soil compaction, and increased runoff potential due to vehicle movement during rehabilitation programs;	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine.	• NEM: BA; • NEMA • NEM: PAA (as amended); and • CARA.

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
			• Loss of organic material, and vegetation cover; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of soil; and • Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats.		
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation of the final land rehabilitation; • Rehabilitation – rehabilitation mainly consists of spreading of the preserved subsoil and topsoil, profiling of the land and re-vegetation; and • Post-closure monitoring and rehabilitation.	Wetlands	• Uneven surfaces and topographies, causing water ponding and changes to the hydrogeomorphology of the wetlands; • The proliferation of AIPs; • Exposure of soils and subsequent compaction, erosion, and sedimentation into the wetlands; • Deterioration of water quality; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of wetlands. • Water and soil contamination; • Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use; and • Decanting.	*Modify, remedy, control, or stop* Concurrent rehabilitation through the life of mine.	• NWA; • NEM:BA; and • NEMA
Closure	Demolition and removal of infrastructure; Rehabilitation and closure.	Aquatics	• Erosion and sedimentation • Altered hydrology; and • Restoration of the pre-mining streamflow regime in the associated watercourses.	Storm water management: Control contamination of receiving waterbodies by consideration of potential contamination sources and strategic closure to minimize on potential environmental impacts.	• NWA; • NEM:BA; and • NEMA.
Closure	closure and removal of infrastructure.	Hydropedology	Contamination of receiving waterbodies	Control contamination of receiving waterbodies by consideration of potential contamination sources and strategic closure to minimize potential environmental impacts.	• NEMA; and • NWA.
Closure	• Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation for the final land rehabilitation.	Noise	Noise emission	Noise control measures; and Noise monitoring.	National Noise Control Regulations.

Phase	Project Activity	Aspect	Impacts	Mitigation type	Standard to be achieved
	• Rehabilitation – rehabilitation mainly consists of spreading and landscaping of the preserved subsoil and topsoil, profiling of the land, and re-vegetation. • Post-closure monitoring and rehabilitation.				
Closure	• Dismantling and removal of infrastructure • Rehabilitation of the Project area • Post-closure monitoring and rehabilitation	Air Quality	Poor air quality due to the generation of dust.	• Control through the implementation of an air quality management plan; • Dust control measure; and • Ambient air quality monitoring	• NEM: AQA and • National Ambient Air Quality Standards.
Closure	Mine closure	Socio-economic	Loss of employment	Control	NEMA
Closure	Electricity use, and operation of mobile and stationary equipment on site.	GHG	Impact on global climate change due to the emission of GHGs.	Control	NEMA

7 Financial Provision

7.1 Determination of the Amount of Financial Provision

7.1.1 Describe the Closure Objectives and the Extent to which they have been Aligned to the Baseline Environment Described Under the Regulation

The objective of the Rehabilitation Plan is to ensure activities associated with the infrastructure located within the mining footprint area will be designed to prevent, minimise or mitigate adverse, long-term, environmental and social impacts and create a self-sustaining ecosystem. The following objectives have been identified thus far:

- Return land disturbed by mining activities as far as possible to land capabilities similar to that which existed prior to mining;
- Ensure that contamination of surrounding areas by mine affected water is limited as far as possible, and that mine affected water is contained or treated post-closure;
- Remove mine infrastructure that cannot be used by a subsequent landowner or a third party. Where buildings can be used by a third party, arrangements will be made to ensure their long-term sustainable use;
- Clean up all stockpile footprint areas and loading areas and rehabilitate these areas to a land capability similar to that which existed prior to mining;
- Follow a process of closure that is progressive and integrated into the short and long term mine plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Rehabilitate the disturbed land to a state that facilitates compliance with applicable environmental quality objectives,
- Landscape the rehabilitated areas in alignment with the surrounding topography to prevent the unnecessary ponding of water and ensure all rehabilitated areas are free draining;
- Physically and chemically stabilise any remaining mining structures (i.e. discard dumps), where required, to minimise residual risk post-closure;
- Leave a safe and stable environment for both humans and animals;
- Prevent soil and surface/groundwater contamination by effectively managing water on site, and ensure clean/ dirty water separation is implemented during the operational period to minimise post-closure contamination potential;
- Comply with local and national regulatory requirements; and

- Ensure the Social and Labour Plan speaks to the closure plan and land use plan, and that social closure objectives (e.g. reskilling, retrenchment management, land use engagement etc.) are progressively met during the operational phase.

7.1.2 Confirm Specifically that the Environmental Objectives in relation to Closure have been Consulted with Landowner and Interested and Affected Parties

Focus Group Meetings (FGMs) were conducted by Digby Wells project management and stakeholder engagement team on 09 and 11 December 2020 with the aim of conducting a stakeholder mapping exercise. The objectives of this exercise were:

- To understand the state of the project-specific environment;
- To identify I&APs that would potentially be impacted by the proposed project; and
- To identify public places where the information material would be placed. The site notices for the stakeholder mapping exercise were placed at various places , refer to Table 10-1.

I&APs were consulted, all comments, concerns raised and received during the commenting period were addressed and included in this report in Section Table 10-3 of Part A.

7.1.3 Provide a Rehabilitation Plan that Describes and Shows the Scale and Aerial Extent of the main Mining Activities, Including the Anticipated Mining Area at the Time of Closure

Table 7-1 provides a summary of the rehabilitation actions and plans which need to be followed. A Rehabilitation Plan has been compiled for the proposed DECM Project and is provided in Appendix R

Table 7-1: Site Specific Rehabilitation and Closure Measures

Aspect/ Area	Rehabilitation measures
Infrastructure	Workshops, Offices, Discard Wash Plant and other Supporting Infrastructure • Demolish and remove all concrete structures to 1 m below ground level; • Dismantle steel structures and store in designated salvage yard prior to removal/selling off; • Demolish brick structures and including concrete foundations; and • Demolish all paving walkways and parking areas. Haul roads, tar and gravel roads • Not applicable since the proposed Haul Roads are located over already disturbed mining land.
Mining Aspects	Opencast pits and mining stockpiles • Not applicable, existing disturbance and not costed for as part of the expansion project. Discard dump • Not applicable, existing disturbance and not costed for as part of the expansion project.
General Surface Rehabilitation	• Not applicable since all infrastructure and roads to be constructed as part of the expansion project are located on already disturbed mining areas.
Monitoring and Maintenance	• Groundwater monitoring costs are included for ten years post-closure; • Surface water monitoring costs are included for ten years post-closure; and • Vegetation monitoring and maintenance on rehabilitated areas are excluded since there are no vegetation establishment costs allocated, under the assumption that the already disturbed land on which the proposed infrastructure will be located is costed for in the site wide closure cost liability for DECM. .

7.1.4 Explain Why it can be Confirmed that the Rehabilitation Plan is Compatible with the Closure Objectives

The Rehabilitation Plan has been compiled in support of the primary closure objectives which are to remove unwanted infrastructure and rehabilitate the land to a suitable mixed end land use which provides a safe and stable environment for surrounding receptors. The post-closure land use should be conducive to livestock grazing and areas not impacted by mining should continue to be utilised as per pre-mining development land use. This end land use can only be determined closer to the end of the LoM. A Rehabilitation Plan has been compiled for the proposed Project area and is provided in Appendix R.

7.1.5 Calculate and State the Quantum of the Financial provision Required to Manage and Rehabilitate the Environment in Accordance with the Applicable Guideline

The estimated financial provision for closure of DECM amounts to **R 18,378,859** (excl. VAT and including P&Gs and Contingencies at 20% and 15%, respectively**.** The closure cost estimate breakdown is included Table 7-2.

Table 7-2: Closure Cost Summary for the Proposed Dorstfontein East Expansion Project

DIGBY WELLS ENVIRONMENTAL	**Digby Wells Environmental** **Exxaro Central Coal (Pty) Ltd, Dorstfontein East Coal Mine, EXX5725 Revision: 0**
Area and Description	**Life of Mine 2034**
Infrastructure demolition	
Area 1: Dorstfontein East	R12,759,441
Sub-total	**R12,759,441**
Rehabilitation	
Area 1: Dorstfontein East	R0
Sub-total	**R0**
Total Demolition & Rehabilitation	**R12,759,441**
Monitoring and Maintenance	
Monitoring Costs (Groundwater and Surface water)	R1,153,614
Sub-total	**R1,153,614**
Preliminary and General (20%)	R2,551,888
Contingency (10%)	R1,913,916
Sub-total	**R4,465,804**
GRAND TOTAL	**R18,378,859**

7.1.6 Confirm that the Financial Provision will be Provided as Determined

Provided that the proposed Project is approved, ECC will provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

8 Monitoring Compliance with and Performance Assessment

ECC will be responsible for the implementation of all monitoring of mitigation and management measures, as well as compliance with the EMPr. The recommended monitoring for the identified impacts is detailed in the subsections below. The Applicant will keep a record of all environmental monitoring taken on site. A summary of the environmental monitoring to be undertaken is included in Table 8-12.

8.1 Monitoring of Impact Management Actions

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. The monitoring programmes have been discussed below.

8.1.1 Soil, Land Use and Land Capability

Table 8-1 describes the monitoring plan which should be followed from the construction phase through to the closure and Monitoring phase. The table below includes each element of monitoring together with the frequency of monitoring and the person responsible thereof.

The monitoring program is based on the following points:

- Monitoring should be done in terms of:
  - Appendix 6 of the EIA Regulations, 2014, (as amended);
  - NEMA;
  - NEM: WA;
  - CARA; and
  - Results of chemical analyses of soils obtained must be compared against the SSV listed in Appendix F and the baseline results as shown in this report to determine if the soil fertility has decreased and or potential harmful elements has increased over time during the LoM
- The Mine Manager (MM) and the Environmental Practitioner (EP) are responsible to report on results of the monitoring program; and
- Internal monitoring reports should be required, reporting on the progress of the state of the monitoring and rehabilitation program. This should be completed after each external monitoring report.

Table 8-1: Monitoring Plan

Monitoring Element	Comment	Requirements	Frequency	Responsibility
Soils • Erosion status; • Compaction; • Runoff; • Contamination; and • Vegetation Cover.	• Soil analysis parameters should include but not limited to pH; Electrical Conductivity; Sulphate; major cations (K, Ca, Mg & Na); trace metals (Al, Fe, Zn, Cu, Mn, Co, Se, Mo, Cd, Ni, Cr (VI), Pb, Hg & As); Anions (NO_3, NO_2, NH_4, Cl, F, PO_4); • The environmental officer is responsible to determine the effectiveness of the erosion control structures; and • The contractor is responsible to undertake the clearing of vegetation and rehabilitation of impacted areas.	• If soil is polluted, treat the soil using in-situ bioremediation; • If in-situ treatment is not possible then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification, and Disposal of Hazardous Material and disposed at an appropriate, permitted or licensed disposal facility; • Repair any damage caused by erosion; • Traffic should be limited where possible while the vegetation is establishing; and • The area must be fenced, and animals should be kept off the area until the vegetation is self-sustaining.	• Annual monitoring of soils and vegetation during the construction phase; • Annual monitoring of soils and vegetation during operational and closure phases; and • Annual monitoring for soils and vegetation for at least three years post-closure, or until rehabilitation has reached a sustainable state with no further changes.	• The Mine Manager and the EP should ensure soil contamination monitoring on-site, especially where hydrocarbons are stored and applied; • EP to give training to sub-contractors and all workers on the operational procedures and mitigation measures; and • The MM and the EP should be responsible to determine the effectiveness of erosion control structures.

8.1.2 Fauna and Flora

A monitoring programme is essential as a management tool to detect negative impacts and variations as they arise and ensure that the necessary mitigation measures are implemented together with the effectiveness of the management measures in place. Table 8-2 describes the monitoring plan that is to be implemented from the construction phase through to monitoring after closure. The program includes each element, frequency of monitoring and the person responsible thereof.

Monitoring should be done in terms of:

- Appendix 6 of the EIA Regulations, 2014, (as amended);
- NEMA;
- NEM: WA;
- National Forest Act, 1998 (Act No. 84 of 1998) (NFA); and
- Mpumalanga Biodiversity Sector Plan (MBSP, 2014).

Table 8-2: Monitoring Plan

Monitoring Element	Comment	Frequency	Responsibility
AIP Management	During the operational phase the presence if AIPs should be detected and monitored every six months. An active programme of weed management, to control the presence and spread of invasive weeds, will need to be instituted so that encroaching weeds (from edge effects and fragmentation) are controlled by means appropriate to the species. This should run for the life of the mine and five years after rehabilitation.	Annually during the wet season (December to February) for the first five years after rehabilitation.	Environmental Officer
Vegetation Cover Monitoring	The natural vegetation cover established on the disturbed areas needs to be monitored annually for the first five years after rehabilitation has been carried out, to ensure that the rehabilitation work has been successful in terms of stabilising the newly formed surfaces (preventing air and water erosion from affecting those surfaces), and that the newly established vegetation cover is trending towards convergence with the original vegetation cover found on the areas prior to disturbance (and on adjacent undisturbed	Annually during the wet season for the first five years after rehabilitation.	Botanist / Flora Specialist

Monitoring Element	Comment	Frequency	Responsibility
	areas). Parameters to be followed during monitoring: • Plant species present/absent; • Weed species composition; • Species density (number of individuals); • Species frequency (number of times species is recorded); • Basal cover; and • Biomass for ground cover.		
Red Data listed fauna and flora	All protected and Red Data plant and animal species must be marked prior to any construction taking place.	Monitored every 6 months from rehabilitation	Field Specialist
Fauna monitoring	This will be closely linked to the flora monitoring to enable scientific conclusions and comparisons. To successfully monitor faunal and floral biodiversity with a Savannah biome, a solid baseline (pre-construction) will be established through the first round of monitoring. This needs to be supplemented with regular repeats to compile a reasonable comparison between the pre-construction faunal communities present and faunal communities found in the same areas during various stages of construction and operation of the proposed project. It is recommended that this monitoring be carried out through the life of the mine and concurrently during rehabilitation.	Monitored every 6 months from rehabilitation	Field Specialist

8.1.3 Wetlands

As the proposed Project Area is comprised largely of wetland habitat, it is recommended that WET-health and WET-Ecoservices tools be used to re-evaluate PES, ES, and EIS on a:

- Once before the wetland Offset strategy is planned as the PES, EIS and ES might be different as presented in this report (2019 findings);
- Annual (yearly) basis by a suitably qualified wetland specialist for the duration of the Construction Phase;

- Annually (one-yearly) for the duration of the Operational Phase;
- Annually (one-yearly) upon closure for at least three years to ensure no emerging impacts are identified, which may need to be addressed.

Recommended transects for monitoring of the wetland health and localities are indicated in Table 8-3. A Wetland Monitoring Programme (Table 8-4) should be initiated before construction activities and continue for the duration of the proposed project and into post-closure.

Table 8-3: Wetland Monitoring Transects

Site	Co-Ordinates	Description
Transect 1	26°14'31.10"S;29°21'57.16"E 26°14'27.14"S;29°22'12.55"E	Transect crosses an unimpacted HS and UVB with high wetland integrity. Road crossing and dam present. Transect s upstream of the proposed mining activities.
Transect 2	26°13'51.43"S;29°21'50.57"E 26°13'47.80"S;29°22'5.93"E	Transect crosses an unimpacted HS with high wetland integrity. Road and cattle grazing present.
Transect 3	26°14'1.49"S;29°21'16.18"E 26°13'48.93"S;29°21'36.82"E	Transect crosses an HS Agriculture as well as a UCV with a dam used for agricultural activities.
Transect 4	26°13'29.52"S;29°22'5.51"E 26°13'26.69"S;29°22'14.92"E	Transect crosses an HS Agriculture that feeds into the main CVB. Sections of erosion present.
Transect 5	26°13'32.71"S;29°21'4.69"E 26°13'27.05"S;29°21'12.74"E	Transect crosses an HS Agriculture that feeds into a dam. Large stands of AIPs and road crossings present.
Transect 6	26°12'47.91"S;29°21'41.89"E 26°12'46.19"S;29°22'0.15"E	Transect crosses an HS that feeds into the large CVB. The transect is downstream of the proposed activities. Areas of erosion and head-cut erosion present.
Transect 7	26°12'4.22"S;29°21'3.10"E 26°12'22.25"S;29°20'58.04"E	Transect crosses an HS fragmented by mining as well as a pan within the current mining activities. The HS and pan have been highly impacted.
Transect 8	26°11'36.01"S;29°20'13.71"E 26°11'32.63"S;29°20'21.03"E	Transect crosses an HS Agriculture that feeds into a CVB fragmented. The transect is upstream of the entire MRA.

NOTE: Proposed transect localities and parameters may require optimisation based on site conditions

Table 8-4: Wetland Monitoring Programme

Monitoring Element Wetlands	Comment	Requirements	Frequency	Responsibility
• Wetland Extent; • Wetland integrity; • Wetland functionality; • Soil disturbances; • Linear infrastructure; • Discharge points; • Erosion status; • Surface water quality and quantity; • Vegetation basal cover;	• Impacts such as damming and infilling can result in a loss of wetland area, whereas seepage from underground workings may cause an increase in wetland extent; • A basic level 1 health assessment is necessary to detect changes to the health of vegetation (including alien invasion), hydrology, and geomorphology of the wetlands	• Inspect the area after a good rainfall event; • Control and remove weeds where necessary; • Define and establish the long-term land management system (grass needs regular defoliation if it is to be sustainable); • Leave pasture to allow natural grasses to become established; • Conduct annual monitoring (repeatable demarcated transect surveys) • There must be no planting of alien plants (e.g. black wattle, eucalyptus and pampas grass) anywhere within the Project Area; • Bi-annual (two-yearly) surveys, aimed at updating the AIPs list and establishing and updating the invasive status of each of the alien species, should be carried out (can be done by Exxaro staff); • The transportation of soils or other substrates infested with AIPs should be strictly controlled; • Benefits to local communities as a result of the alien plant control program should be maximised by not only ensuring that local labour is employed but by also ensuring that cleared alien trees are treated as a valuable wood resource that can be utilised;	• Annual (yearly) basis by a suitably qualified wetland specialist for the duration of the Construction Phase; • Annually (one-yearly) for the duration of the Operational Phase; • Annually (one-yearly) upon closure for at least three years to ensure no emerging impacts are identified, which may need to be addressed.	• A wetland specialist must conduct the wetland monitoring and provide a short memo to the Mine Manager (MM) and the Environmental Practitioner (EP); • The MM and the EP should ensure wetland monitoring on-site; • EP to give training to sub-contractors and all

Monitoring Element Wetlands	Comment	Requirements	Frequency	Responsibility
• Vegetation species diversity; • Mine related infrastructure has been fully rehabilitated.	associated with the site. This allows for the determination of the PES; • The EIS of the wetlands should be regularly determined to detect any alteration to functionality.	• It is considered essential that appropriate veld management (particularly appropriate grazing levels and burning frequencies) should be applied to areas of secondary indigenous vegetation (e.g. secondary grassland of historically cultivated areas), and especially the grassland and wetland vegetation of untransformed habitats. Appropriate grazing levels and burning frequencies will not only ensure that good vegetation conditions and biodiversity levels are maintained but will also serve to control the spread and increase in cover of palatable AIPs such as Paspalum dilatatum. • Constant site surveys and monitoring should be incorporated to ensure no further erosion of the wetlands. If any changes to the landscape are observed immediate action need to be taken such as silt traps; • Continuous erosion monitoring of rehabilitated areas should be undertaken and zones with excessive erosion should be identified. Erosion can either be quantified or the occurrence there-of simply recorded for the specific location; • The functionality of the surface water drainage systems should be assessed on an annual basis. This should preferably be done after the first major rains of the season and then after any major storm. An assessment of the structures will ensure that the drainage on the recreated		workers on the operational procedures and mitigation measures; and • The MM and the EP should be responsible to determine the effectiveness of erosion control structures.

Monitoring Element Wetlands	Comment	Requirements	Frequency	Responsibility
		profile matches the rehabilitation plan as well as to detect early on when any drainage structures are not functioning efficiently. These must then be repaired or replaced before it causes significant erosion damage; and • The groundwater levels and quality should be measured and monitored in a similar way to the surface water to determine the impact of the mining activities on the groundwater resources. A hydrogeologist, together with the relevant authorities, should determine the locations of the monitoring boreholes. The monitoring frequency will be determined by the regulator.		

8.1.4 Aquatics

An aquatic biomonitoring programme has been developed for the monitoring and preservation of the aquatic ecosystems assessed for the proposed Project. This programme is aimed at better determining the ecological health of the ecosystems as well as to act as an early detection tool for impacts that might severely affect the expected aquatic biota in the associated riverine systems.

Table 8-5 outlines the aquatic monitoring methods undertaken at the monitoring points set out, refer to Appendix G on an biannual basis by a qualified aquatic ecologist. The annual programme comprises of a single survey during the autumn season (or low flow season) for the Study Area and a single survey during the spring season (or high flow). This will determine the PES for the assessed aquatic ecosystems which will further determine whether the proposed Project is impacting the associated aquatic ecology and to what extent. The following stressor, habitat and response indicators should be evaluated:

- **Stressor indicators**
  - *In situ* water quality
  - Water toxicity
- **Habitat indicator:**
  - Instream and riparian habitat conditions (IHI, version 2)
  - Aquatic macroinvertebrate biotope evaluation (IHAS, Version 2.2).
- **Response indicators:**
  - Aquatic macroinvertebrate assessment (SASS5 and MIRAI)
  - FRAI
  - Invertebrate incubation/hatching assessment
  - Determination of the integrated EcoStatus (EcoStatus 4, Version 1.02).

Table 8-5: Biomonitoring Programme

Method and Aquatic Component of Focus	Details	Goal/Target	Recommended Ecological Category
Water Quality: • *In situ* water testing focusing on temperature, pH, conductivity and oxygen content.	• Water quality should be tested on a biannual basis at each monitoring site to determine the extent of change from baseline results.	No noticeable change from the REC	• Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.

Method and Aquatic Component of Focus	Details	Goal/Target	Recommended Ecological Category
			• Dissolved organic carbon concentrations must not cause the ecosystem to become unsustainable • The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption)
Habitat Quality: • Instream and riparian habitat integrity; and • Availability/suitability of macroinvertebrate habitat at each monitoring site.	• The application of the IHI should be done on a reach basis for the Olifants River, the Steenkoolspruit and associated tributaries; • The IHAS must be applied at each monitoring site	• The Ecological Category determined for each assessed site must be maintained and improved for the watercourses); and • The baseline IHAS scores should improve.	Must be in a *Largely Modified* or better condition ≥ D (≥ 42)

Method and Aquatic Component of Focus	Details	Goal/Target	Recommended Ecological Category
	prior to sampling.		
Macroinvertebrates: • Macroinvertebrate assemblages must be assessed biannually.	• This must be done through the application of the latest SASS, incorporated with the application of the MIRAI as outlined in this Aquatic Study.	• The baseline SASS5 scores should not noticeably deteriorate; and • Baseline Ecological Categories should not be allowed to drop in category for each assessed site.	Must be in a *Largely Modified* or better condition ≥ D (≥ 42)
Fish: • Fish assemblages must be assessed biannually	• Sampling of fish must be undertaken by means of a standard electro-narcosis techniques followed by the application of FRAI for applicable reaches.	Baseline Ecological Categories should not be allowed to drop in category for each assessed site. The main goal for the Project must be to conserve the expected species.	Must be in a *Largely Modified* or better condition ≥ D (≥ 42)

The Project should not commence without inclusion of the above Aquatic Biomonitoring Programme.

8.1.5 Surface Water

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented.

This report recommends or provides a surface water monitoring programme with clearly defined monitoring points to be implemented by the mine throughout the life of mine and post closure. All water quality results should be benchmarked to relevant water quality objectives to determine any impact on the quality of water (positive/negative). The surface water monitoring plan is summarised in Table 8-6.

Table 8-6: Surface Water Monitoring Plan

Monitoring Element	Comment	Frequency	Responsibility
Water quality	Water quality monitoring should continue to include historical monitoring points as well as the newly sampled points in adjacent rivers. Parameters should include but not limited to; pH, Electrical Conductivity, Aluminium, Sulphates, Phosphates, Iron, Manganese, Calcium, Magnesium, Nitrate, Ammonia, Fluoride, Chloride, Total dissolved solids, Suspended Solids; Sodium, Uranium, Potassium, heavy metals (e.g. As, Ni, Cu, Pb, Cr, Bo, Hg) It is also recommended to monitor water quality within the mine water dams or water containment facilities to determine the concentration levels in case of an overflow or need for discharge.	-Monthly during operation and closure (hydrocarbons can be done on a quarterly basis at all surface water monitoring points in Table 8-7 below). -Monitoring needs to carry on three years after the project has ceased, as is standard or best practice to detect residual impacts.	Environmental Officer
Water quantity	Flow monitoring should be carried out between flow linkages to obtain accurate flow volumes.	In operational areas where automatic flow meters are in place, daily records need to be kept	Environmental Officer
Physical structures and Storm Water Management Plan (SWMP) performance	Personnel should have a walk around facilities to determine the facilities conditions and pick out any anomalies such as leaks or overflows and system malfunctions. Storm water channels, and existing mine dams are inspected for silting and blockages of inflows, pipelines for hydraulic integrity; monitor the overall SWMP performance.	Continuous process and formal report after every 3 years	Environmental Officer

Monitoring Element	Comment	Frequency	Responsibility
Meteorological data	Measure rainfall to provide more accurate rainfall records, if possible	Real time system with tipping bucket rain gauge or alternatively using bulk rain gauge.	Environmental Officer

Monitoring Points

The proposed monitoring points and their descriptions are presented in Table 8-7.

Table 8-7: Monitoring Points and Associated Descriptions

Monitoring Point	Description	Coordinates
Historical Points		
ED01	Ericksen Dam 1	S26.1925 E29.3541
ED02	Ericksen Dam 2	S26.1925 E29.3543
ED03	Ericksen Dam 3	S26.1926 E29.3546
DCM06	Upstream of Western tributary	S26.2183 E29.3676
DCM07	Downstream of Western tributary	S26.1907 E29.3688
DCM08	Pond downstream of Pit 1	S26.1939 E29.3395
MP01	Downstream on western tributary of the Olifants River	S26.1714 E29.34
MP02	Downstream on western tributary of the Olifants River	S26.1728 E29.343
MP03	Bridge upstream of the old Transvaal Navigation Colliery	S26.1365 E29.345
MP04	Confluence of MP01 and MP02 tributaries with the Olifants River	S26.1555 E29.3436
MP05	Downstream of Transvaal Navigation Colliery	S26.1694 E29.3568
MP06	Upstream of mining activities on the Olifants River	S26.1681 E29.3746
Pan	Pan	S26.2054 E290.3504
PCD01	Pollution Control Dam 1	S26.1855 E29.3593
PCD02	Pollution Control Dam 2	S26.1861 E29.36
PCD03	Pollution Control Dam 3	S26.1878 E29.3597
RWDF	Return Water Discard Facility	S29.3430 E29.3430
Additional Proposed Points		
UPSW1	Upstream of eastern boundary tributary 1	S26.2533; E29.4054
UPSW2	Upstream of eastern boundary tributary 2	S26.2783; E29.3873
WPSW3	South of proposed opencast excavation	S26.2301; E29.3279

UWBSW4	Upstream western boundary	S26.2808; E29.3163
DWBSW5	Downstream western boundary	S26.2291; E29.2908

8.1.6 Groundwater

The groundwater monitoring network design should comply with the risk-based source-pathway-receptor principle. A groundwater-monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. Both the impact on water quality and water quantity should be catered for in the monitoring system. The boreholes in the network should cover the following: contaminant sources, receptors and potential contaminant plumes. Furthermore, monitoring of the background water quality and levels is also required. Groundwater monitoring will be undertaken to establish the following:

- The impact of mine dewatering on the surrounding aquifers. This will be achieved through monitoring of groundwater levels in the monitoring boreholes. If private boreholes are identified within the zone of impact on groundwater levels, these will be included in the monitoring programme;
- Groundwater inflow into the mine workings. This will be achieved through monitoring of groundwater levels in the monitoring boreholes as well as measuring water volumes pumped from mining areas;
- Groundwater quality trends. This will be achieved through sampling of the groundwater in the boreholes at the prescribed frequency; and
- The rate of groundwater recovery and the potential for decant after mining ceases. This can be achieved through measuring groundwater levels in the underground mine workings. Stage curves will be drawn to assess the inflow into defunct workings.

It is proposed that groundwater monitoring be undertaken according to the schedule presented in Table 8-8 for the points shown in .

Table 8-8: Groundwater Monitoring Programme

Monitoring position	Sampling interval	Water Quality Standards
Construction, Operational, Closure and Post Closure Phases		
All monitoring boreholes	Quarterly: measuring the depth of groundwater levels	N/a
All monitoring boreholes	Quarterly: sampling for water quality analysis	South African Water Quality Guidelines: Domestic Use
Rainfall	Daily at the mine	N/a

Laboratory analysis techniques will comply with SANS guidelines. The mine will develop a groundwater monitoring database that will be updated on a monthly or quarterly basis as information becomes available. The database will be used to analyse the information and evaluate trends noted.

An annual compliance report will be compiled and submitted to the authorities for evaluation and comment. The mine will develop a monitoring response protocol after the completion of the Construction Phase of the project. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required

8.1.7 Air Quality

It is recommended that the historic dustfall monitoring network be revived and maintained to ensure regular collection of baseline data for the LoM. In addition to the aforementioned, it is recommended that a continuous real-time monitoring station with the ability to measure both particulates and gases be commissioned before the commencement of the construction phase activities. The frequency of monitoring will ensure that diurnal, seasonal, annual, and inter-annual records are available to inform management decision making. Table 8-9 shows the criteria pollutants that should be measured and the frequency of monitoring.

Table 8-9: Recommended Monitoring Plan

Method	Frequency	Target	Responsibility
Monitoring in accordance with: • EN14097 for PM2.5; • EN12341 for PM10; and • American Standard Test Method ASTM 1739-98 in SANS1137:2019	• Monthly dustfall monitoring; • Continuous PM_{10}, $PM_{2.5}$ monitoring; • Continuous monitoring of gases: SO_2, NO_2, and CO	Particulate pollutants from the ongoing mining operation must be kept below the South African standards: • GN R 1210 of 24 December 2009 • GN R 486 of June 2012; and • GN R 827 of 1 November 2013	A designated Environmental Officer (EO) onsite to collect ambient air quality data and submit it to an independent consultant for interpretation and reporting.

8.1.8 Noise

Although the noise emissions /impacts from the operational phase on the receivers is low, it is recommended that a monitoring plan be implemented to monitor future noise emissions (increases and/or decreases in noise levels) throughout the LoM. Components to be included in the proposed monitoring programme are discussed below:

- Noise monitoring is to be conducted throughout all phases (Construction, Operation and Decommission) of the Project's life; and
- Bi-annual noise measurements must be conducted at the prescribed locations as per the baseline noise measurement locations of this report.

Table 8-10: Noise Monitoring Programme

Monitoring Element	Comment	Frequency	Responsibility
Noise Monitoring	Noise monitoring in line with the requirements of SANS 10103:2008 on-site, and at selected receivers	Bi-annual Noise Monitoring	Mine Environmental Officer

8.1.9 Socio-economic

The key social aspects that require monitoring are summarised in Table 8-11.

Table 8-11: Summary of Social Aspects to be Monitored

Monitoring Element	Comment	Frequency	Responsible Department
Local employment targets	Review against set local employment targets	Quarterly	Human Resources
Local procurement targets	Review the numbers of local businesses in programmes either as individuals or JVs	Quarterly	Human Resources
Community and workforce health, safety, and security	Ongoing identification, management, monitoring of HSS risks	Daily	Health and Safety Community Development
Structural integrity of houses	Ongoing monitoring of structural integrity of houses near the mine after blasting	Quarterly or when required (i.e., after stakeholder complaints)	Health and Safety Stakeholder Engagement
Water quality and quantity	Implement standard operating protocols Track and monitor the number of grievances registered on the matter	Weekly	Environmental Stakeholder Engagement

Monitoring Element	Comment	Frequency	Responsible Department
Air quality	Implement standard operating protocols Track and monitor the number of grievances registered on the matter	Weekly	Environmental Stakeholder Engagement
Grievance registration	Track and monitor the number of grievances registered and addressed	Daily / weekly	Stakeholder Engagement

8.2 Monitoring and Reporting Frequency

The monitoring and reporting frequency for the monitoring programmes per environmental aspect are supplied in Table 8-12.

8.3 Responsible Persons

The responsible persons for the respective monitoring programmes are detailed in Table 8-12.

8.4 Time Period for Implementing Impact Management Actions

The time period for implementing impact management actions has been provided for in Table 8-12.

8.5 Mechanism for Monitoring Compliance

Table 8-12 sets out the monitoring and management programme of environmental impacts for the DECM Project.

Table 8-12: Monitoring and Management of Environmental Impacts

Project Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities throughout the Project.	Soils, Land Use and Land Capability	Soils • Erosion status; • Compaction; • Runoff; • Contamination; and • Vegetation Cover.	• If soil is polluted, treat the soil using in-situ bioremediation; • If in-situ treatment is not possible then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification, and Disposal of Hazardous Material and disposed at an appropriate, permitted or licensed disposal facility; • Repair any damage caused by erosion; • Traffic should be limited where possible while the vegetation is establishing; and • The area must be fenced, and animals should be kept off the area until the vegetation is self-sustaining.	• The MM and the EP should ensure soil contamination monitoring on-site, especially where hydrocarbons are stored and applied; • EP to give training to sub-contractors and all workers on the operational procedures and mitigation measures; and • The MM and the EP should be responsible to determine the effectiveness of erosion control structures.	• Annual monitoring of soils and vegetation during the construction phase; • Annual monitoring of soils and vegetation during operational and closure phases; and • Annual monitoring for soils and vegetation for at least three years post-closure, or until rehabilitation has reached a sustainable state with no further changes.
	Fauna and Flora	Alien Invasive Management	During the operational phase the presence if AIPs should be detected and monitored every six (6) months. An active programme of weed management, to control the presence and spread of invasive weeds, will need to be instituted so that encroaching weeds (from edge effects and fragmentation) are controlled by means appropriate to the species. This should run for the life of the mine and five years after rehabilitation.	Environmental Officer	Annually during the wet season (December to February) for the first five years after rehabilitation.
	Fauna and Flora	Vegetation Cover Monitoring	The natural vegetation cover established on the disturbed areas needs to be monitored annually for the first five years after rehabilitation has been carried out, to ensure that the rehabilitation work has been successful in terms of stabilising the newly formed surfaces (preventing air and water erosion from affecting those surfaces), and that the newly established vegetation cover is trending towards convergence with the original vegetation cover found on the areas prior to disturbance (and on adjacent undisturbed areas). Parameters to be followed during monitoring: • Plant species present/absent; • Weed species composition; • Species density (number of individuals); • Species frequency (number of times species is recorded); • Basal cover; and • Biomass for ground cover.	Botanist / Flora Specialist	Annually during the wet season for the first five years after rehabilitation.
	Fauna and Flora	Red Data listed fauna and flora	All protected and Red Data plant and animal species must be marked prior to any construction taking place.	Field Specialist	Monitored every 6 months from rehabilitation
	Fauna and Flora	Fauna monitoring	This will be closely linked to the flora monitoring to enable scientific conclusions and comparisons. To successfully monitor faunal and floral	Field Specialist	Monitored every 6 months from rehabilitation

Project Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time periods for implementing impact management actions
			biodiversity with a Savannah biome, a solid baseline (pre-construction) will be established through the first round of monitoring. This needs to be supplemented with regular repeats to compile a reasonable comparison between the pre-construction faunal communities present and faunal communities found in the same areas during various stages of construction and operation of the proposed project. It is recommended that this monitoring be carried out through the life of the mine and concurrently during rehabilitation.		
	Wetlands	• Wetland Extent; • Wetland integrity; • Wetland functionality; • Soil disturbances; • Linear infrastructure; • Discharge points; • Erosion status; • Surface water quality and quantity; • Vegetation basal cover; • Vegetation species diversity; and • Mine related infrastructure has been fully rehabilitated.	• Inspect the area after a good rainfall event; • Control and remove weeds where necessary; • Define and establish the long-term land management system (grass needs regular defoliation if it is to be sustainable); • Leave pasture to allow natural grasses to become established; • Conduct annual monitoring (repeatable demarcated transect surveys) • There must be no planting of alien plants (e.g. black wattle, eucalyptus and pampas grass) anywhere within the Project Area; • Annual surveys, aimed at updating the AIPs list and establishing and updating the invasive status of each of the alien species, should be carried out (can be done by Exxaro staff); • The transportation of soils or other substrates infested with AIPs should be strictly controlled; • Benefits to local communities as a result of the alien plant control program should be maximised by not only ensuring that local labour is employed but by also ensuring that cleared alien trees are treated as a valuable wood resource that can be utilised; • It is considered essential that appropriate veld management (particularly appropriate grazing levels and burning frequencies) should be applied to areas of secondary indigenous vegetation (e.g. secondary grassland of historically cultivated areas), and especially the grassland and wetland vegetation of untransformed habitats. Appropriate grazing levels and burning frequencies will not only ensure that good vegetation conditions and biodiversity levels are maintained but will also serve to control the spread and increase in cover of palatable AIPs such as Paspalum dilatatum. • The deposition of eroded materials and the understanding of volumes moved concerning the plan should be assessed monthly; • Constant site surveys and monitoring should be incorporated to ensure no further erosion of the wetlands. If any changes to the	• A wetland specialist must conduct the wetland monitoring and provide a short memo to the MM and the EP; • The MM and the EP should ensure wetland monitoring on-site; • EP to give training to sub-contractors and all workers on the operational procedures and mitigation measures; and • The MM and the EP should be responsible to determine the effectiveness of erosion control structures.	• Annual (yearly) basis by a suitably qualified wetland specialist for the duration of the Construction Phase; • Annually (one-yearly) for the duration of the Operational Phase; and • Annually (one-yearly) upon closure at least three years to ensure no emerging impacts are identified, which may need to be addressed.

Project Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time periods for implementing impact management actions
			landscape are observed immediate action need to be taken such as silt traps; • Continuous erosion monitoring of rehabilitated areas should be undertaken and zones with excessive erosion should be identified. Erosion can either be quantified or the occurrence there-of simply recorded for the specific location; • The functionality of the surface water drainage systems should be assessed on an annual basis. This should preferably be done after the first major rains of the season and then after any major storm. An assessment of the structures will ensure that the drainage on the recreated profile matches the rehabilitation plan as well as to detect early on when any drainage structures are not functioning efficiently. These must then be repaired or replaced before it causes significant erosion damage; and • The groundwater levels and quality should be measured and monitored in a similar way to the surface water to determine the impact of the mining activities on the groundwater resources. A hydrogeologist, together with the relevant authorities, should determine the locations of the monitoring boreholes. The monitoring frequency will be determined by the regulator.		
	Surface water	Water quality	Water quality monitoring should continue to include historical monitoring points as well as the newly sampled points in adjacent rivers. Parameters should include but not limited to; pH, Electrical Conductivity, Aluminium, Sulphates, Phosphates, Iron, Manganese, Calcium, Magnesium, Nitrate, Ammonia, Fluoride, Chloride, Total dissolved solids, Suspended Solids; Sodium, Uranium, Potassium, heavy metals (e.g. As, Ni, Cu, Pb, Cr, Bo, Hg) It is also recommended to monitor water quality within the mine water dams or water containment facilities to determine the concentration levels in case of an overflow or need for discharge.	Environmental Officer	• Monthly during operation and closure; (hydrocarbons can be done on a quarterly basis). • Monitoring needs to carry on three years after the project has ceased, as is standard or best practice to detect residual impacts
	Surface water	Water quantity	Flow monitoring should be carried out downstream of discharge point or between flow linkages to obtain accurate flow volumes.	Environmental Officer	In operational areas where automatic flow meters are in place, daily records need to be kept.
	Surface water	Physical structures and Storm Water Management Plan (SWMP) performance	Personnel should have a walk around facilities to determine the facilities conditions and pick out any anomalies such as leaks or overflows and system malfunctions.	Environmental Officer	Continuous process and yearly formal report.
	Surface water		Storm water channels, and existing mine dams are inspected for silting and blockages of inflows, pipelines for hydraulic integrity; monitor the overall SWMP performance.		

Project Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time periods for implementing impact management actions
	Air Quality	Monitoring in accordance with: • EN14097 for PM2.5; • EN12341 for PM10; and • American Standard Test Method ASTM 1739-98 in SANS1137:2019	Particulate pollutants from the ongoing mining operation must be kept below the South African standards: • GN R 1210 of 24 December 2009 • GN R 486 of June 2012; and • GN R 827 of 1 November 2013	A designated Environmental Officer (EO) onsite to collect ambient air quality data and submit it to an independent consultant for interpretation and reporting.	• Monthly dustfall monitoring; • Continuous PM_{10}, $PM_{2.5}$ monitoring; and • Continuous monitoring of gases: SO_2, NO_2, and CO
	Noise	Noise Monitoring	Noise monitoring in line with the requirements of SANS 10103:2008 on-site, and at selected receivers.	Mine Environmental Officer	Quarterly Noise Monitoring
	Socio-economic	Local employment targets	Review against set local employment targets.	Human Resources	Quarterly
	Socio-economic	Local procurement targets	Review the numbers of local businesses in programmes either as individuals or JVs.	Human Resources	Quarterly
	Socio-economic	Community and workforce health, safety, and security	Ongoing identification, management, monitoring of HSS risks.	Health and Safety Community Development	Daily
	Socio-economic	Structural integrity of houses	Ongoing monitoring of structural integrity of houses near the mine after blasting.	Health and Safety Stakeholder Engagement	Quarterly or when required (i.e., after stakeholder complaints)
	Socio-economic	Water quality and quantity	• Implement standard operating protocols; and Track and monitor the number of grievances registered on the matter.	Environmental Stakeholder Engagement	Weekly
	Socio-economic	Air quality	• Implement standard operating protocols; and • Track and monitor the number of grievances registered on the matter.	Environmental Stakeholder Engagement	Weekly
	Socio-economic	Grievance registration	Track and monitor the number of grievances registered and addressed.	Stakeholder Engagement	Daily / weekly

8.6 Environmental Management Measures for the Current DECM Operation

Table 8-13 below deals with key impacts associated with operational and closure phases of the project. All activities must continue to be managed, mitigation and management measures to be implemented, and the responsible individuals/organisations who should implement these measures.

Table 8-13: Environmental Management Measures for the Current DECM Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
Ensure all construction staff is familiar with the Environmental Awareness Plan.	• The contractor is expected to have safety "tool box" talks in accordance with the risks and trends associated with the project. Proof of these talks shall be kept on site.	Daily	Contractor	ECO	Closure phase
Increase employment opportunities.	• Identify opportunities for the employment /procurement and training of people and contractors from the local area.	Once-off	Contractor	Project Manager	Closure phase
	• Develop a recruitment and training strategy that the main construction contractors will have to adhere to.	Once-off	Contractor	Project Manager	Closure phase
	• Monitor implementation of local recruitment and training strategies, including monitoring of corruption and nepotism	Once-off	Contractor	Project Manager	Closure phase
	• Employ and train the youth and females where possible.	Once-off	Contractor	Project Manager	Closure phase
	• Communication with locals regarding job opportunities and skills requirements to manage expectations.	Once-off	Contractor	Project Manager	Closure phase
	• Procurement of suppliers must be as per the SLP and Exxaro policy and standards.	Once-off	Contractor	Project Manager	All Phases
Minimise social pathogens and unhealthy behaviour.	• Implement local recruitment and training strategies and policies, and clearly communicate these locally through relevant authorities and media.	Prior to Construction	Project Manager	Exxaro	All Phases
	• Do not recruit informally at the gate but follow a formal recruitment process.	Daily	Project Manager	Exxaro	All Phases
	• 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.	Prior to Construction	Project Manager	Exxaro	All Phases
Protect social - economic environment of local land users.	• Inform Exxaro employees and neighbouring landowners and inhabitants about operation activities (specifically for blasting).	Monthly	Exxaro	Exxaro	Operation
Minimise damage caused by blasting activities.	• Alert adjacent land owners of construction blasting activities and times in a timeous manner.	Prior to each blast	Project Manager	ECO	Operation
	• Ensure requirements for human health and safety relating to blasting are adhered to avoid unnecessary damage to infrastructure and/or crops.	During each blast	Project Manager	SHE Representative	Operation
	• Stakeholder engagement channels and grievance procedure mechanisms need to be developed prior to construction and need to be ongoing and frequent.	Prior to construction	Project Manager	ECO	Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
Prevent groundwater contamination.	• All spillages will need to be cleaned up as soon as practically possible.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Proper management of stormwater drainage infrastructure should be ensured.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• 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	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Grouting and capping of boreholes located within the footprint of construction activities be required prior to construction activities	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Spill kits will be made available in areas of likely spillage.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• All hydrocarbon storage containers will be stored within a bunded areas which are water tight and able to contain 110% of the stored volume.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• All equipment utilising hydrocarbons will be stored on a hard standing surface.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Should privately owned boreholes be affected surrounding the Pit 1, Exxaro will supply the owners with potable water for domestic use.	Quarterly	Exxaro	Project Manager	Operation, Closure Phase
Rehabilitate mining areas.	• All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite.	As soon as possible following operation	Contractor	Exxaro	Closure Phase
	• The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas.	Following operation	Exxaro	SHE Representative	Closure Phase
	• The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts.	Following operation	Exxaro	SHE Representative	Closure Phase
	• Surface water monitoring of the streams will be essential.	Following operation	Exxaro	SHE Representative	Closure Phase
	• Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure.	Following operation	Exxaro	SHE Representative	Closure Phase
	• The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored.	Following operation	Exxaro	SHE Representative	Closure Phase

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
Minimise AMD potential.	• 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.	Following operation	Exxaro	SHE Representative	Closure Phase
Minimise AMD potential.	• An impermeable or partially permeable layer should be recreated at variable depth within the rehabilitated landscape.	Following operation	Exxaro	SHE Representative	Closure Phase
	• 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.	Following operation	Exxaro	SHE Representative	Closure Phase
Prevent erosion and sedimentation.	• Erosion can be limited by ensuring that mine vehicles and human movement is limited to project specific dedicated access ways.	Monthly	Contractor	ECO	All Phases
	• 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.	Monthly	Contractor	ECO	All Phases
Prevent surface water contamination and reduction in water quality.	• Place spill kits on site which are operated by trained staff members for the *adhoc* remediation of minor chemical and hydrocarbon spillages.	Monthly	Contractor	ECO / SHE Representative	Closure Phase
	• Access to the construction site will be controlled.	Daily	Contractor	ECO / SHE Representative	All Phases
	• Refuelling areas will be bunded and nozzles protected from spillage during refuelling.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Vehicular access to the stream will be restricted.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Proper management of stormwater drainage infrastructure should be ensured.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• 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.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Bunded areas will be water tight and inspected for leaks on a frequent basis. Leaks to the bunded areas will be rectified as soon as possible.	Monthly	Contractor	ECO / SHE Representative	All Phases

Objective	Monitoring				
	Mitigation Measure and Management Measures	**Timeframe**	**Executing Party**	**Monitoring Party**	**Project Stage**
	• Drip trays will be utilised for the collection of leaks from vehicles and machinery parked for long period of time.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Should a spill occur, this will be handled at the source of the leak and prevented from transpiring to nearby watercourse.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Ensure that routine maintenance on all vehicles is undertaken as per maintenance schedule and records are kept.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Sewage spillages will be seen as hazardous waste and will be handled as such.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Frequent monitoring of the pipeline should be done to ensure leakages are identified and repaired timeously.	Monthly	Exxaro	ECO / SHE Representative	Operation
	• Runoff from compacted and built-up surfaces should be slowed down by the strategic placement of berms.	Monthly	Contractor	ECO / SHE Representative	Operation
Ensure adequate clean and dirty water separation.	• Construct diversion drains around the site timeously prior to operation.	Prior to Construction	Contractor	ECO / SHE Representative	Operation
	• Ensure adherence to GNR 704 of the NWA.	Prior to Construction	Exxaro	ECO / SHE Representative	Operation
Minimise Turbidity of local streams	• Construct sediment collection paddocks downstream of the working activities to minimise uncontrolled runoff from the site.	Prior to Construction	Exxaro	ECO / SHE Representative	Operation , Closure phase
	• Minimise the areas that are to be stripped of vegetation.	Monthly	Exxaro	ECO / SHE Representative	Operation , Closure phase
	• Adequate storm water management should be considered in the detailed design of the proposed infrastructure in order to minimize undue erosion.	Prior to Construction	Exxaro	ECO / SHE Representative	Operation , Closure phase
	• Stormwater runoff will be directed towards natural watercourses.	Weekly	Exxaro	ECO / SHE Representative	Operation
	• 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 structure thereby preventing erosion and incision of the natural watercourse.	Monthly	Exxaro	ECO / SHE Representative	Operation
	• 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.	Monthly	Exxaro	Contractor	Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
Prevent surface water contamination through ineffective waste management and housekeeping.	• Waste will be disposed of in accordance to the waste management procedure. Monthly volumes of water will be measured and reported to Exxaro.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Housekeeping will be kept up to standard. Housekeeping should be done after every shift.	Monthly	Contractor	ECO / SHE Representative	Operation , Closure phase
	• 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.	Prior to Operation	ECO / SHE Representative	ECO / SHE Representative	Operation
	• No waste may be disposed of to land without the necessary legal permits.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• 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.	Monthly	Contractor	ECO / SHE Representative	All Phases
	• Sufficient waste receptacles will be placed around the site allowing the separation of waste at source.	Monthly	Contractor	ECO / SHE Representative	All Phases
Reduce impacts arising from insufficient rehabilitation	• Restrict vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities.	Monthly	Contractor	ECO / SHE Representative	Operation
	• No dumping of waste should take place. If any spills occur, they should be immediately cleaned up.	Monthly	Contractor	ECO / SHE Representative	Operation
	• No trapping or hunting of any faunal species is to take place.	Monthly	Contractor	ECO / SHE Representative	Operation
	• Establishment of reintroduced vegetation must be monitored during the operational phase	Monthly	Exxaro	SHE Representative	Operation
Protect faunal and floral habitats and diversity.	• Appropriate sanitary facilities must be provided during the construction phase and all waste must be removed to an appropriate waste facility.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Fertilize and re-vegetate topsoil stockpiles as soon as possible.	Monthly	Exxaro	SHE Representative	Operation
	• The construction and operational footprint must be kept as small as possible in order to minimise impact on the surrounding environment.	Monthly	Contractor	ECO / SHE Representative	Operation
	• Areas where pipeline construction has been complete, will be backfilled and rehabilitated as soon as possible to re-establish faunal migration.	Monthly	Contractor	ECO / SHE Representative	Operation
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• Edge effect control needs to be implemented within construction areas, with specific consideration to erosion control and alien floral species management.	Monthly	Contractor	ECO / SHE Representative	Operation
Minimise proliferation of Alien Vegetation.	• Implement an alien plant management and eradication program.	Quarterly	Exxaro	ECO / SHE Representative	Operation
	• Removal of alien vegetation should commence during the construction phase and continue during the operational and decommissioning phases.	Quarterly	Exxaro	ECO / SHE Representative	Operation
	• 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.	Quarterly	Contractor	ECO / SHE Representative	Operation
	• No vehicles should be allowed to drive through riparian areas during the eradication of alien and weed species.	Quarterly	Contractor	ECO / SHE Representative	Operation
	• Removal of alien and weed species must take place in accordance with existing legislation process and procedures.	Quarterly	Exxaro	ECO / SHE Representative	Operation
Minimise impact on faunal and floral habitats as a result of waste management.	• No dumping of waste should take place. If any spills occur, they should be immediately cleaned up.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• No construction-related waste material is to enter wetland or other natural habitats.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Conserve the ecological and biological structure of wetland habitats.	• Access roads for support vehicles, and vehicles used in the construction of the crossings, should not encroach into the freshwater features	Monthly	Contractor	ECO / SHE Representative	Operation
	• Rehabilitation should be conducted in a manner that ensures that the wetland features' conditions are reinstated to as natural a state as possible.	Monthly	Contractor	ECO / SHE Representative	Operation
	• The wetland features must be rehabilitated immediately after the construction phase.	Monthly	Contractor	ECO / SHE Representative	Operation
	• 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 vehicle and construction personnel.	Monthly	Contractor	ECO / SHE Representative	Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	**Timeframe**	**Executing Party**	**Monitoring Party**	**Project Stage**
Minimise Change and effectiveness of Wetland Service Provision.	• 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, 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.	Monthly	Contractor	ECO / SHE Representative	Operation
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• An annual alien vegetation management plan should be implemented throughout the operational phase of the project.	Annually.	Exxaro	SHE Representative	Operation and Closure phase
Protect the wetlands hydrological functioning	• Rehabilitation should be conducted in a manner that ensures that the wetland features' conditions are reinstated to as natural a state as possible.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Flow continuity and connectivity of the freshwater features must be reinstated post- construction activities.	Monthly	Contractor	SHE Representative	Operation
	• 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.	Monthly	Contractor	SHE Representative	Operation
Minimise impacts arising from dust generation.	• 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.	Monthly	Contractor	ECO	Operation and Closure phase
	• A dust-monitoring programme must be implemented that effectively monitors dust related impacts from the project area.	Monthly	Contractor	ECO / SHE Representative	Operation
	• 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.	Monthly	Exxaro	SHE Representative	Operation
	• Speed limited will be restricted to 40 km/h.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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	Monthly	Exxaro	SHE Representative	Operation and Closure phase

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• 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.	Monthly	Exxaro	SHE Representative	Operation and Closure phase
Reduce carbon emissions.	• Where applicable, use a fuel sources with low sulphur content	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Prohibit unnecessary idling of vehicles.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Minimise impacts on infrastructure and land occupiers during blasting activities.	• Reduce Charge Mass/Delay over decreasing distance towards POI's of concern.	During each Blast	Exxaro	SHE Representative	Operation and Closure phase
	• Notify all affected parties in advance prior to any blasting activity.	Prior to blasting	Exxaro	SHE Representative	Operation and Closure phase
	• Notify all affected parties in advance prior to any blasting activity.	Prior to blasting	Exxaro	SHE Representative	Operation and Closure phase
	• Prior to blasting a 500 m radius must be cleared of people and animals.	Prior to blasting	Exxaro	SHE Representative	Operation and Closure phase
	• Immediate action will take place should thresholds exceed legal requirements for air blast (134 dB) and ground vibration (12.5 mm/s).	During each Blast	Exxaro	SHE Representative	Operation and Closure phase
	• Increase stemming length.	Prior to blasting	Exxaro	SHE Representative	Operation and Closure phase
	• Put in controls for management of stemming lengths.	Prior to blasting	Exxaro	SHE Representative	Operation and Closure phase
Reduce Fumes generated during blasting.	• Use the correct products for the blasting activities	Prior to blasting	Contractor	Blasting Foreman	Operation and Closure phase
	• Control the product quality	Prior to blasting	Contractor	Blasting Foreman	Operation and Closure phase
	• Same day charge and blast.	Prior to blasting	Contractor	Blasting Foreman	Operation and Closure phase
Minimise visual disturbance and sense of place.	• Natural vegetation, wherever practical, must be retained on and around the preconstruction sites	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• Cleared areas will be kept as small as possible.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon.	Quarterly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Construction activities will have screened from sensitive receptors and rubble removed from site on a regular basis.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Litter and dust management measures should be in place at all times.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• The sites should be kept neat and tidy at all times.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• On site pre-construction activities will be limited to be undertaken between 6am and 6pm.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• The topsoil stockpile should be vegetated to reduce the visual impact associated with the bare soil.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• External signage should be kept to a minimum, and where possible should be attached to existing buildings.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Minimise the emission of noise pollution during construction and operation activities.	• Cover the dust source with closely-knit vegetation	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Keep speed limit below 40 km/h.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Hauling vehicles with low noise levels to be used and must be maintained in a good order at all times.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Conduct baseline noise monitoring prior to constriction activities.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Implement a noise monitoring programme to measure against the baseline noise assessment.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• The project will investigate using equipment and applying technology that results in the generation of less noise than existing equipment and technology.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• Building activities to take place during daytime only.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Safe blasting methods to be used under controlled conditions.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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	Prior to Operation	Contractor	SHE Representative	Operation
	• It is strongly recommended that the high-pitched alarms be replaced with devices that produce high levels of broadband noise	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Emergency generators to be placed in such a manner that it is away from residential areas.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Minimise soil erosion.	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Maintain vegetation cover on rehabilitated land and topsoil stockpiles.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Construct soil erosion protection measures should erosion be identified.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Reduce soil sterilisation	• All vehicles should be serviced on a regular basis at the specific demarcated areas.	Monthly	Contractor	ECO / SHE Representative	Operation.
	• Any spillage from vehicles should be cleaned up as soon as possible.	Monthly	Contractor	ECO / SHE Representative	Operation
	• Rehabilitate areas where the planned tasks have been completed.	Monthly	Contractor	ECO / SHE Representative	Operation.
	• Topsoil stockpiles should be protected from contamination of waste, waste water and hazardous materials.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Waste piles should be placed on impervious layer to prevent direct soil contact.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• Excavate and dispose of any contaminated soil at the appropriate landfill as per waste classification.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Minimise land use alterations	• Restrict vehicle movement to areas of need.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Prevent soil contamination and ensure rehabilitation.	• Existing established roads should be used wherever possible.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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 watercourses.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation and Closure phase
Minimise loss of soil resources.	• Map all stockpile locations	Monthly	Exxaro	ECO / SHE Representative	Operation
	• Topsoil should never be used as a filling material for roads	Monthly	Exxaro	ECO / SHE Representative	Operation
	• Height of stockpiles be restricted between of 4 – 5 metres maximum. For extra stability and erosion protection, the stockpiles may be benched	Monthly	Exxaro	ECO / SHE Representative	Operation
	• 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.	Monthly	Exxaro	ECO / SHE Representative	Operation
	• Use recycled grey water from washing facilities to spray un-vegetated areas to combat dust	Monthly	Exxaro	ECO / SHE Representative	Operation
Protection of archaeological, historical and any other site or land considered being of cultural value.	• 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	Monthly	Contractor	ECO / SHE Representative	Operation
	• Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site.	Monthly	Contractor	ECO / SHE Representative	Operation

Objective	Monitoring				
	Mitigation Measure and Management Measures	Timeframe	Executing Party	Monitoring Party	Project Stage
	• 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 South African Heritage Resources Authority (SAHRA). A heritage official should be part of the team executing these measures	Monthly	Contractor	ECO / SHE Representative	Operation
	• 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.	Monthly	Contractor	ECO / SHE Representative	Operation
Protection of graves	• Maintain a buffer zone of 100 metres during construction and mining phase form all graves	Monthly	Contractor	ECO / SHE Representative	Operation
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.	Monthly	Contractor	ECO / SHE Representative	Operation
Reduce impacts on topographic character	• The construction site will be kept neat, tidy, and free of litter.	Monthly	Contractor	ECO / SHE Representative	Operation
	• Rubble will be removed frequently.	Monthly	Contractor	ECO / SHE Representative	Operation
Minimise mining waste	• Mining will be conducted strictly according to the mine plan submitted to the DMR.	Monthly	Exxaro	SHE Representative	Operation
	• Optimally exploit this resource in terms of tonnage of rock mined and cost as provided for in the mine plan.	Monthly	Exxaro	SHE Representative	Operation
Reduce greenhouse gas emissions.	• Plant and machinery will be maintained so that no unnecessary emissions are expelled.	Monthly	Exxaro	SHE Representative	Operation
	• Appropriate technology and machinery will be utilised for the job at hand.	Monthly	Exxaro	SHE Representative	Operation
	• A Green House Gas Emissions assessment will be calculated as part of the initiative to reduce greenhouse gas emissions.	Monthly	Exxaro	SHE Representative	Operation
Minimise cumulative impacts	• Through the implementation of all the above-mentioned mitigation measures, the overall significance of the activity's impact can be lowered to LOW.	Monthly	Exxaro	ECO / SHE Representative	Operation and Closure phase

9 Indicate the Frequency of the Submission of the Performance Assessment/ Environmental Audit Report

In accordance with the EIA Regulations, 2014 (as amended), an external independent Environmental Audit will be undertaken every year. The Environmental Audit Report will be submitted to the DMRE and other relevant authorities where required.

10 Environmental Awareness Plan

The sub-sections below outline the Environmental Awareness Plan for the proposed DECM Project. The Environmental Awareness Plan is primarily a tool to introduce and describe the requirements of the range of environmental and social plans for the proposed Project during the life of the Project.

10.1 Manner in which the Applicant Intends to Inform his or her Employees of Any ENvironmental Risk which May Result from their Work

Section 39 of the MPRDA requires Mining to develop an environmental awareness plan to inform the employees of any environmental risks which may result from their work. Therefore, the objectives of the environmental awareness plan will be:

- To educate employees regarding their role in conserving the environment and the importance of conserving natural resources,
- To identify environmental training needs for employees and contractors at all levels,
- To ensure that employees whose work could cause significant environmental impact as identified by the mine are competent to perform those tasks to which they are assigned,
- To enable employees to identify environmental impacts or non-conformances of their work activities on the environment,
- To familiarise employees with emergency preparedness and response requirements,
- To be aware of the potential consequences of deviation from specified operating procedures, and
- To conduct their work and manage mining activities in an environmentally responsible manner.

10.2 Manner in which Risks will be Dealt with in Order to Avoid Pollution or the Degradation of the Environment

Management shall establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from external I&APs. The organisation shall consider processes for external communication on its significant environmental aspects and record its decisions. Communication is a management responsibility. All line supervisors are responsible for effective communication within their own sections. Methods for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from I&APs must be established for the Project. Environmental risks will be dealt.

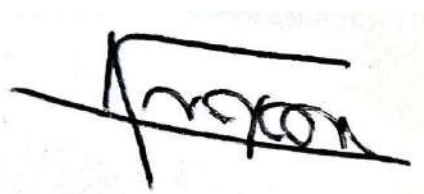
11 Specific Information Required by the Competent Authority

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by NEMA, as amended, which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will continue to be reviewed annually.

12 Undertaking

The EAP herewith confirms:-

- the correctness of the information provided in the reports
- the inclusion of comments and inputs from stakeholders and I&APs ;
- the inclusion of inputs and recommendations from the specialist reports where relevant; and
- the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the Environmental Assessment Practitioner:	Kelly Tucker 
Name of Company:	Digby Wells Environmental
Date:	01 October 2021

Appendix A: EAP CV and Qualifications

Appendix B: Plans

Plan 1: Land Tenure Map

Plan 2: Regional Setting

Plan 3: Locality Map

Plan 4: Infrastructure Layout Map

DIGBY WELLS
ENVIRONMENTAL

Appendix C: PP Chapter

Appendix D: Soils, Land Use and Land Capability Assessment

Appendix E: Fauna and Flora Assessment

Appendix F: Wetlands Assessment

Appendix G: Aquatic Ecology Assessment

Appendix H: Hydropedological Assessment

Appendix I: Surface Water Assessment

Appendix J: Groundwater Assessment

Appendix K: Air Quality Assessment

Appendix L: Noise Assessment

Appendix M: Heritage Assessment

Appendix N: Visual Assessment

Appendix O: Traffic Assessment

Appendix P: Social Impact Assessment

Appendix Q: Greenhouse Gas Emissions Assessment

Appendix R: Rehabilitation and Closure

Appendix S: EMPr Amendment for Mining Right [Ref. No. MP 30/5/1/2/2/51MR] (April 2008/August 2009)

Appendix T: EMP for the Dorstfontein East Mine Extension of Pit 1 and Water Transportation Pipeline from Dorstfontein West to Dorstfontein East (SRK, October 2017) [Ref. No. MP 30/5/1/2/3/2/1 (51) MR]

Appendix U: Historical Authorisations for the DECM

Appendix V: Scoping Report Acceptance Letter

Appendix W: Extension Letter