mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Scoping Report

for Listed Activities Associated with the Proposed Xivono Mining (Pty) Ltd Weltevreden Mine

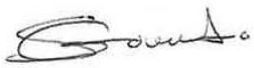
DMR Reference Number: MP 1320 PR (Graduation from Prospecting Right to Mining Right Application)

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

Name of Applicant:	Xivono Mining (Pty) Ltd
Tel no:	+27 11 867 0836
Fax no:	+27 11 867 0520
Postal Address:	PO Box 90349 Bertsham 2013
Physical Address:	Block A, Infinity Office Park, 2 Robin Close, Meyersdal
File Reference Number SAMRAD:	MP 1320 PR

This document has been prepared by Digby Wells Environmental.

Report Type:	**Draft Scoping Report**
Project Name:	**Xivono Weltevreden Coal Mining Project near Belfast, Mpumalanga**
Project Code:	**MBU5710**

Name	Responsibility	Signature	Date
Xanthe Taylor	Project Administrator		July 2019
Sanusha Govender	Project Manager		July 2019
Barbara Wessels	Project Sponsor		July 2019

This report is provided solely for the purposes set out in it and may not, in whole or in part, be used for any other purpose without Digby Wells Environmental prior written consent.

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 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 can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 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 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 Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner 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 SCOPING PROCESS

The objective of the scoping process is, through a consultative process, to: -

- identify the relevant policies and legislation relevant to the activity;
- motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- identify the key issues to be addressed in the assessment phase;
- agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
- identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

The Applicant, Xivono Mining (Pty) Ltd (a subsidiary of the Mbuyelo Group (Pty) Ltd), has an existing Prospecting Right (reference number 1320PR) for the proposed Weltevreden Mining Project approximately 8km south of Belfast in the Mpumalanga Province of South Africa. Xivono appointed Digby Wells Environmental as the independent Environmental Assessment Practitioner (EAP) to manage the legislated environmental application processes which include the following applications required to commence with mining:

- Mining Right Application in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA);
- Integrated Environmental Authorisation Application 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. 56 of 2008) (NEM:WA); and
- An integrated Water Use Licence Application in terms of the National Water Act, 1998 (Act No. 26 of 1998) (NWA).

Project Applicant

The Applicant is Xivono Mining (Pty) Ltd, a subsidiary of the Mbuyelo Group (Pty) Ltd.

Company name:	Xivono Mining (Pty) Ltd
Contact person:	Martha Mokonyane
Physical address:	Block A, Infinity Office Park No 2 Robin Close Meyersdal, Alberton, 1448
Telephone:	013 656 3732/3
Email:	martham@mbuyelo.com

Project Overview

The Prospecting Right includes Portions 28, 29, 30 and 40 of the farm Paardeplaats 380 JT, Portions 2, 3, 10 and a Portion of Portions 4, 7, 9, 11, 12, 14 and the Remaining Extent of the farm Weltevreden 381 JT. Not all of the Prospecting Right area will be mined and therefore the proposed mining activities and associated infrastructure will take place on the Remaining Extent (RE) of Portion 3, Portion 9, and Portion 381 of the Farm Weltevreden 381 JT. The Prospecting Right is divided into an east and west section by the R33 road which runs in a north-south direction through the site.

The proposed mining activities will only take place on the western half of the Prospecting Right Area which covers a surface area of approximately 800 hectares. The eastern portion will not

be mined nor accommodate any mining-related infrastructure. Xivono proposes to mine two pits, OC1 (162 ha footprint) and OC2 (200 ha footprint) through open pit mining. Xivono plans to utilise containers for the mine offices and workshop infrastructure which will occupy a footprint of approximately 0.03 ha (300 m^2). Other surface infrastructure proposed for the site includes a pollution control dam, crushing and screening plant (no washing to take place on site), Run of Mine (ROM) pad, overburden dump, stockpiles, pipelines, weighbridge, diesels storage and lined trenches. The conceptual mine layout is currently being developed and the stormwater management infrastructure will be developed in the Environmental Impact Assessment (EIA) Phase of the Project. The surface infrastructure is expected to have a footprint of approximately 1 ha.

Purpose of this Report

The Environmental Impact Assessment (EIA) process is a tool to identify and manage potential impacts on the environment as a result of a particular project. Environmental risks associated with such a project are also identified and mitigation measures proposed. The completion of an EIA is a regulatory requirement in terms of the provisions of the NEMA and the EIA process which is regulated in accordance with the EIA Regulations, 2014[1] (the EIA 2014 Regulations, as amended). The overarching purpose of the EIA process is to determine, assess and evaluate the environmental and social consequences (positive and negative) of a proposed development, activity or project.

This Scoping Report forms part of the EIA process and aims to identify those biophysical and socio-economic issues or concerns that require investigation as well as determine feasible alternatives. This information is then used to determine the scope of work for the impact assessment phase of the EIA process. During the Scoping Phase, people interested or affected by the project are informed of the project as well as provided the opportunity to raise issues and concerns they may have. The objectives of the Scoping Report are, therefore, to:

- Describe the Project and the associated activities;
- Provide a summary of the Baseline Environment;
- Predict potential positive and negative impacts as a result of the Project and its activities, and identify potential measures to minimise negative impacts and enhance positive impacts;
- Provide a proposed Plan of Study for the EIA Phase; and
- Share the Project information with Interested and Affected Parties (I&APs) and to record the issues and comments raised by all stakeholders.

Environmental Consultants

[1] GN R982 published in Government Gazette 38282 of 4 December 2014 (as amended, 2017)

Digby Wells Environmental (Digby Wells) has been appointed by Xivono as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA, the Integrated Water Use Licence (IWUL) as well as the associated specialist studies and the required Public Participation Process (PPP) for the proposed project. The details of the EAP are contained in the table below.

Company name:	Digby Wells and Associates (South Africa) (Pty) Ltd
Contact person:	Sanusha Govender
Physical address:	Digby Wells House, 48 Grosvenor Road, Bryanston, Johannesburg, 2191
Telephone:	011 789 9495
Email:	Sanusha.Govender@digbywells.com

Approach and Methodology for the Public Participation Process

A Public Participation Process has been initiated, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by the Project are given an opportunity to identify concerns to ensure that local knowledge, needs and values are understood and taken into consideration as part of the EIA process.

This Draft Scoping Report will be made available for public comment for a period of 30 days and all comments or concerns raised will be recorded and responded to in the Comments and Responses Report (CRR). The 30-day comment period is from **05 August 2019 to 06 September 2019.**

The following activities were undertaken to announce the Project and initiate the Scoping Phase:

- A Background Information Document (BID) was distributed;
- Newspaper advertisement was placed in the Middelburg Observer newspaper on 02 August 2019
- An announcement letter including a registration form was distributed via e-mail to I&APs;
- Site notices were placed around the site; and
- Hard copies of the Draft Scoping Reports are available at Emakhazeni Public Library (Belfast), Siyathuthuka Library, and on the Digby Wells website.

Project Alternatives

The following alternatives have been considered for this application process:

- Design and layout of the mine and mine-related infrastructure: the preliminary layout has been considered for the Scoping Report; however, this will be refined during the EIA Phase;

- Mining method: Open pit and underground mining alternatives have been considered in this document;
- Transportation of coal product: The options to transport coal via road and proposed route alternatives will be considered and refined during the EIA Phase; and
- The “No-go” alternative: This alternative refers to the status quo remaining and the project not going ahead.

Conclusions and Recommendations

A preliminary sensitivity map was compiled based on desktop research to assist in determining the overall sensitivity of the site and how best to avoid, minimise or mitigate potential impacts from the proposed mining operation.

The sensitivity plan shows that the proposed Project area is characterised by wetlands, mostly associated with the southern pit, known as OC1. The reserves in question are part of National Protected Areas Expansion Strategies (NPAES) areas, but the project area does not traverse any National Protected Areas Expansion Strategies (NPAES) areas and there are no protected areas in the proximity of the project area. A serval and a pair of breeding cranes have also been identified on site. A number of graves have also been identified and will be considered in the Impact Assessment Phase.

The preliminary impacts as identified in this Scoping Phase are mostly reduced by the mitigation measures identified, except where any wetlands will be mined through. The option to reduce pit OC1 to avoid these wetlands will be considered in the EIA Phase. The socio-economic positive socio-economic benefits will be realised through the implementation of the Social and Labour Plan submitted as part of this application, as well as the proposed employment as a result of this application being approved.

All environmental aspects which may be affected by the proposed Project will be subject to Impact Assessments and presented in the EIA Report, with mitigation measures to manage the identified impacts.

TABLE OF CONTENTS

1 Introduction 1
2 Project Applicant 1
2.1 Details of the Applicant 2
2.2 Item 2(a)(i): Details of EAP 2
2.3 Item 2(a)(ii): Expertise of the EAP 3
3 Item 2(b): Description of the Property 3
4 Item 2(c): Locality Map 5
5 Item 2(d): Description of the Scope of the Proposed Overall Activity 6
5.1 Listed and specified activities 6
5.2 Description of the Activities to be undertaken 10
5.2.1 Reserves and Product 10
5.2.2 Resource Access, Production and Scheduling 10
6 Item 2(e): Policy and legislative context 12
7 Item 2(f): Need and desirability of the proposed activities 20
7.1 Questions To Be Engaged With When Considering Need and Desirability 20
8 Item 2(g): Period for which the environmental authorisation is required 41
9 Item 2(h): Description of the process followed to reach the proposed preferred site 41
9.1 Item 2(h)(i): Details of all alternatives considered 41
9.1.1 Design and Layout of the Project 41
9.1.2 Mining Method Alternatives 41
9.1.3 Transportation of Coal 41
9.1.4 The "No-Go" Alternative 41
9.2 Item 2(h)(ii): Details of the public participation process followed 41
9.3 Item 2(h)(iii): Summary of issues raised by I&APs 43
10 Item 2(h)(iv): The environmental attributes associated with the sites 43
10.1 Topography and drainage 43
10.2 Geology 46
10.2.1 Regional geology 46

10.2.2 Local geology 46
10.3 Climate 49
10.3.1 Precipitation 51
10.3.2 Wind Speed 52
10.3.3 Temperature and Humidity 53
10.4 Surface Water 53
10.4.1 Sensitivity Assessment 55
10.5 Groundwater 57
10.5.1 Hydrocensus 58
10.5.2 Groundwater Levels 63
10.5.3 Groundwater Quality 64
10.5.4 Environmental Sensitivity 65
10.6 Soil and Land Capability 68
10.7 Wetlands and Aquatic Ecology 68
10.7.1 Regional Biodiversity Importance 70
10.8 Flora 78
10.8.1 Regional vegetation 78
10.8.2 Species of Conservation Concern (SCC) 80
10.8.3 Alien and Exotic Vegetation 84
10.9 Fauna 85
10.9.1 Mammals 85
10.9.2 Herpetofauna 87
10.9.3 Birds (Avifauna) 91
10.9.4 Invertebrates 93
10.9.5 Species of Special Conservation Concern 99
10.10 Air Quality 99
10.10.1 Particulate Matter (PM_{10}) 99
10.10.2 Sulfur Dioxide (SO_2) 100
10.10.3 Nitrogen Dioxide (NO_2) 100
10.11 Noise 101
10.12 Socio-Economic 102

10.12.1 Primary Study Area 102
10.12.2 Secondary Study Area 103
10.12.3 Economic Profiles 103
10.12.4 Baseline Profile of Emakhazeni Local Municipality 106
10.13 Cultural Heritage 115
10.13.1 Archaeo-Historical Context 116
10.13.2 Existing Environment 119
10.13.3 Results from the Pre-Disturbance Survey and Historical Imagery 121
11 Item 2(h)(v): Impacts Identified 125
11.1 Item 2(h)(vi): Methodology Used in Determining the Significance of the Environmental Impacts 125
11.1.1 Impact Rating 125
11.2 Item 2(h)(vii): 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 133
11.3 Item 2(h)(viii): The Possible Mitigation Measures that could be Applied and the Level of Risk 134
11.4 Item 2(h)(ix): The Outcome of the Site Selection Matrix and Final Layout Plan ... 134
11.5 Item 2(h)(x): Motivation Where No Alternatives Sites were Considered 134
11.6 Item 2(h)(xi): Statement Motivating the Preferred Site 134
12 Item 2(i): Plan of Study for the Environmental Impact Assessment Process 135
12.1 Specialist Methodologies for the EIA Phase 137
12.1.1 Surface Water 138
12.1.2 Groundwater 139
12.1.3 Soils 139
12.1.4 Wetlands 140
12.1.5 Aquatics 141
12.1.6 Fauna and Flora 142
12.1.7 Air Quality 145
12.1.8 Noise 146
12.1.9 Socio-Economic 148
12.1.10 Cultural Heritage 149

12.1.11 Traffic 153

12.1.12 Blasting 153

12.2 Item 2(i)(ix): Measures to Avoid, Reverse, Mitigate, or Manage Identified Impacts and to Determine the Extent of the Residual Risks that Need to be Managed and Monitored 154

13 Item 2(l): Other Information Required by the Competent Authority 166

13.1 Impact on the Socio-Economic Conditions of any Directly Affected Person 166

13.2 Impact on any National Estate Referred to in Section 3(2) of the National Heritage Resources Act 166

14 Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act 166

15 Undertaking Regarding Correctness of Information 167

16 Undertaking Regarding Level of Agreement 167

17 References 168

LIST OF FIGURES

Figure 3-1: Proposed Infrastructure Layout 4

Figure 4-1: Project Local Setting 5

Figure 5-1: Coal Process Flow Diagram 11

Figure 10-1: Topographical Map 45

Figure 10-2: Regional Geology 48

Figure 10-3: Monthly Rainfall Distribution for Quaternary X11D 49

Figure 10-4: Monthly evaporation and rainfall for quaternary X11D 50

Figure 10-5: Monthly runoff distribution for quaternary X11D 50

Figure 10-6: Total Monthly Precipitation 51

Figure 10-7: Average number of days with precipitation 52

Figure 10-8: Monthly Average Wind Speed 52

Figure 10-9: Temperature and Humidity 53

Figure 10-10: Hydrological setting of the Weltevreden project site 54

Figure 10-11: Combined surface water, ecological and paleo-sensitivities at the Weltevreden project site 56

Figure 10-12: Hydrocensus Map 62
Figure 10-13: Bayesian Correlation between Surface Elevation and Groundwater Level 63
Figure 10-14: Piper Diagram 64
Figure 10-15: Expanded Durov Diagram 65
Figure 10-16: NFEPA Wetlands 72
Figure 10-17: Mpumalanga Biodiversity Sector Plan 75
Figure 10-18: Mining and Biodiversity Guideline 77
Figure 10-19: Regional Vegetation Types 79
Figure 10-20: Species with the Potential to Occur on Site (Google Images, 2019) 82
Figure 10-21: PM_{10} Ambient Concentration Monitored at Middelburg Monitoring Station – DEA in 2018 99
Figure 10-22: SO_2 Middelburg monitoring station – DEA in 2018 100
Figure 10-23:NO_2 Hourly average concentration Middelburg monitoring station – DEA in 2018 101
Figure 10-24: Heritage Resources Identified within the Greater Study Area 116
Figure 10-25: Current Environment within the Project Area 121
Figure 10-26: Select Heritage Resources Identified - 123
Figure 10-27: Results of the Pre-disturbance Survey 124
Figure 12-1: Perceived Biodiversity Value (Coombes, 2004) 144

LIST OF TABLES

Table 2-1: Contact Details of the Applicant 2
Table 2-2: Contact details of the EAP 2
Table 3-1: Property Description 3
Table 5-1: Listed and Specified Activities 7
Table 6-1: Policy and Legislative Context 13
Table 7-1: Need and Desirability 21
Table 9-1 Public Participation Scoping Phase Activities 42
Table 10-1: Boreholes and Springs Identified during the Hydrocensus 58
Table 10-2: Field Parameters 60

Table 10-3: Groundwater Levels Measured 61
Table 10-4: Baseline Groundwater Quality Analysis 66
Table 10-5: Summary of Site Characteristics and Attributes of the Study Area 69
Table 10-6: NFEPA Wetland Classification Ranking Criteria 71
Table 10-7: Mpumalanga Biodiversity Sector Plan Categories 73
Table 10-8: Mining and Biodiversity Guidelines Categories (Department of Environmental Affairs *et al.* 2013) 76
Table 10-9: List of Potential Flora Species in the Project Area, ... 80
Table 10-10: Protected Plant Species under the Mpumalanga Nature-Conservation Act (MPNCA) that could potentially occur on site 83
Table 10-11: Alien Invasive Plant Species Potentially Occurring on Site 84
Table 10-12: Mammal Species Potentially Occurring on Site 85
Table 10-13: Herpetofauna Potentially Occurring on Site 87
Table 10-14: Red Data and Endemic Avifauna Species Potentially Occurring on Site 91
Table 10-15: Invertebrate Species Potentially Occur on Site 94
Table 10-16: Primary and Secondary Study Area 103
Table 10-17: Alignment of the NDM's Strategic Goals to NDM's Development Objectives 104
Table 10-18: Population in the Primary Study Area 106
Table 10-19: Population in the Secondary Study Area 107
Table 10-20: Population Groups (%) in the Primary Study Area 107
Table 10-21: Age and Gender in the Primary Study Area 108
Table 10-22: Most Spoken Languages (%) in the Primary Study Area 108
Table 10-23: Province of Birth (%) for Primary Study Area: 108
Table 10-24: Women and Child-headed Households (in %) in the Primary Study Area 109
Table 10-25: Population 20 Years and Older by Highest Education Leven (%) in the Primary Study Area 109
Table 10-26: Employment Status (5) in the Primary Study Area 110
Table 10-27: Income Bracket of Employed Individuals (%) in Primary Study Area 110
Table 10-28: Annual Income Brackets of Households (%) in the Primary Study Area 111
Table 10-29: Annual Income Brackets of Households (%) in Belfast and Siyathutuka 111
Table 10-30: Household Access to Water (%) in the Primary Study Area 112
Table 10-31: Household Access to Sanitation in the Primary Study Area 113

Table 10-32: Household Access to Energy (%) in the Secondary Study Area 113
Table 10-33: Population Groups (%) in the Primary Study Area 114
Table 10-34: Population Groups (%) in the Primary Study Area 115
Table 10-35: Periods in Mpumalanga 115
Table 10-36: Ceramic Facies Commonly Found in Mpumalanga 118
Table 10-37: Summary of the vegetation setting of the Project 120
Table 10-38: Heritage Resources identified through the pre-disturbance survey 122
Table 11-1: Impact Assessment Parameter Ratings 127
Table 11-2: Probability / Consequence Matrix 131
Table 11-3: Significance Rating Description 133
Table 12-1: Plan of Study 136
Table 12-2: Description of the Various HGM Units for Wetland Classification 140
Table 12-3: Score Table Describing the Biodiversity Value Scores 145
Table 12-4: Acceptable Rating Levels for Noise in Districts (SANS 10103, 2008) 146
Table 12-5: Categories of Community / Group Noise Response (SANS 10103, 2008) 148
Table 12-6: Secondary Data Sources 151
Table 12-7: Aerial Imagery Considered 152
Table 12-8: Feature and Period Codes Relevant to this HIA 152
Table 12-9: Preliminary Impacts and Mitigation Measures 156

LIST OF APPENDICES

Appendix 1: EAP CV and Qualifications
Appendix 2: Plans

ABBREVIATIONS

AP	Acid Generating Potential
ASTP	Average Score per Taxon
CR	Critical Endangered
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
dBA	Decibels
Digby Wells	Digby Wells Environmental
DMR	Department of Mineral Resources (previously known as DME)
DWAF	Department of Water and Forestry
DWS	Department of Water and Sanitation (previously DWA)
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
FRAI	Fish Response Assessment Index
GDP	Gross Domestic Product
GN	Government Notice
HGM	Hydro-geomorphic Unit
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IHAS	Invertebrate Habitat Assessment System
IHI	Index of Habitat Integrity
IUCN	International Union for the Conservation of Nature
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
LC	Least Concern
LoM	Life of Mine
MAE	Mean Annual Evaporation
mamsl	Metres Above Mean Sea Level

MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	Metres Below Ground Level
MIRAI	Macroinvertebrates Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NDCR	National Dust 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)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act, 1999 (Act No. 25 od 1999)
NT	Near Threatened
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PCD	Pollution Control Dam
PES	Present Ecological Status
PPP	Public Participation Process
RHP	River Health Programme
ROM	Run of Mine
RWQO	Resource Water Quality Objectives
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SANAS	South African National Accreditation System
SASS5	South African Scoring System version 5
SHE	Safety, Health and Environment
SSC	Species of Special Concern
TDS	Total Dissolved Solids
ToR	Terms of Reference
VU	Vulnerable
WMA	Water Management Area

1 Introduction

Xivono Mining (Pty) Ltd (hereinafter Xivono) is the holder of an approved Prospecting Right for the proposed Weltevreden Mining Project approximately 8 km south of Belfast in the Mpumalanga Province of South Africa. Xivono proposes to mine two pits, OC1 (162 ha footprint) and OC2 (200 ha footprint) through open pit mining. Refer to Appendix 2 for the location of the proposed Weltevreden Mining Project area. The local setting plan is attached in Appendix 2.

Xivono plans to utilise containers for the mine offices and workshop infrastructure which will occupy a footprint of approximately 0.03 ha (300 m^2). Other surface infrastructure proposed for the site includes pollution control dams, a crushing and screening plant (no washing to take place on site), Run of Mine (ROM) pad, overburden dump, stockpiles, pipelines, weighbridge, diesel storage and lined trenches. The conceptual mine layout is currently being developed and the stormwater management infrastructure will be developed in the Environmental Impact Assessment (EIA) Phase of the Project. The infrastructure is expected to have a footprint of approximately 1 ha.

The proposed Project area is located within the Nkangala District Municipality (NDM), specifically in Ward 1 of the Emakhazeni Local Municipality (ELM). The nearest large settlements to the site are the town of Belfast (11 km) and its township of Siyathuthuka (15 km).

The Prospecting Right includes Portions 28, 29, 30 and 40 of the farm Paardeplaats 380 JT, Portions 2, 3, 10, and a portion of Portions 4, 7, 9, 11, 12, 14 and the Remaining Extent of the farm Weltevreden 381 JT. The Prospecting Right will lapse on 22 August 2021 as authorised by the Department of Mineral Resources (DMR).

Xivono intends to convert the approved Prospecting Right through completing a Mining Right Application (MRA) in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). Concurrently, Xivono will initiate this Integrated Environmental Authorisation and Water Use Licence Application (IWULA) process for the MRA to comply with the:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act, 2008 (Act No. 56 of 2008) (NEM:WA); and
- National Water Act, 1998 (Act No. 36 of 1998) (NWA).

2 Project Applicant

The Project Applicant is Xivono Mining (Pty) Ltd (Xivono), a subsidiary of Mbuyelo Group (Pty) Ltd, who is the holder of the Prospecting Right (reference number MP 1320 PR) for the farm portions associated with this application.

2.1 Details of the Applicant

Table 2-1 provides the contact details of the applicant.

Table 2-1: Contact Details of the Applicant

Name of Applicant:	Xivono Mining (Pty) Ltd		
Registration number (if any):	2006/023906/07		
Trading name (if any):	-		
Responsible person: ***(E.g. CEO, Director, etc.)***	Kurhula Bilankulu		
Contact person:	Martha Mokonyane		
Physical address:	Block A, Infinity Office Park No 2 Robin Close Meyersdal, Alberton, 1448		
Postal address:	PO Box 90349 Bertsham		
Postal code:	2091		
Telephone:	013 656 3732/3	**Fax:**	013 656 3614
Email:	martham@mbuyelo.com		

2.2 Item 2(a)(i): Details of EAP

Digby Wells Environmental (Digby Wells) has been appointed by Xivono as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA according to NEMA and the Integrated Water Use Licence (IWUL) according to the National Water Act, 1998 (NWA) as well as the associated specialist studies and the required Public Participation Process (PPP) for the proposed project. The details of the Environmental Assessment Practitioner are contained in the table below.

Table 2-2: Contact details of the EAP

Company name:	Digby Wells and Associates (South Africa) (Pty) Ltd
Contact person:	Sanusha Govender
Physical address:	Digby Wells House, 48 Grosvenor Road, Bryanston, Johannesburg, 2191
Telephone:	011 789 9495
Email:	Sanusha.Govender@digbywells.com

2.3 Item 2(a)(ii): Expertise of the EAP

Sanusha Govender is a Senior Environmental Consultant at Digby Wells. She holds a Bachelor of Science (BSc) in Environment & Development together with over 13 years of experience as both an Environmental Impact Assessment Consultant and as a Sustainability Programme Manager. She has project managed and delivered quality products on a range of environmental assessments and sustainability solutions. Projects have included EIA's across various sectors, managing large teams of interdisciplinary specialists and advisors.

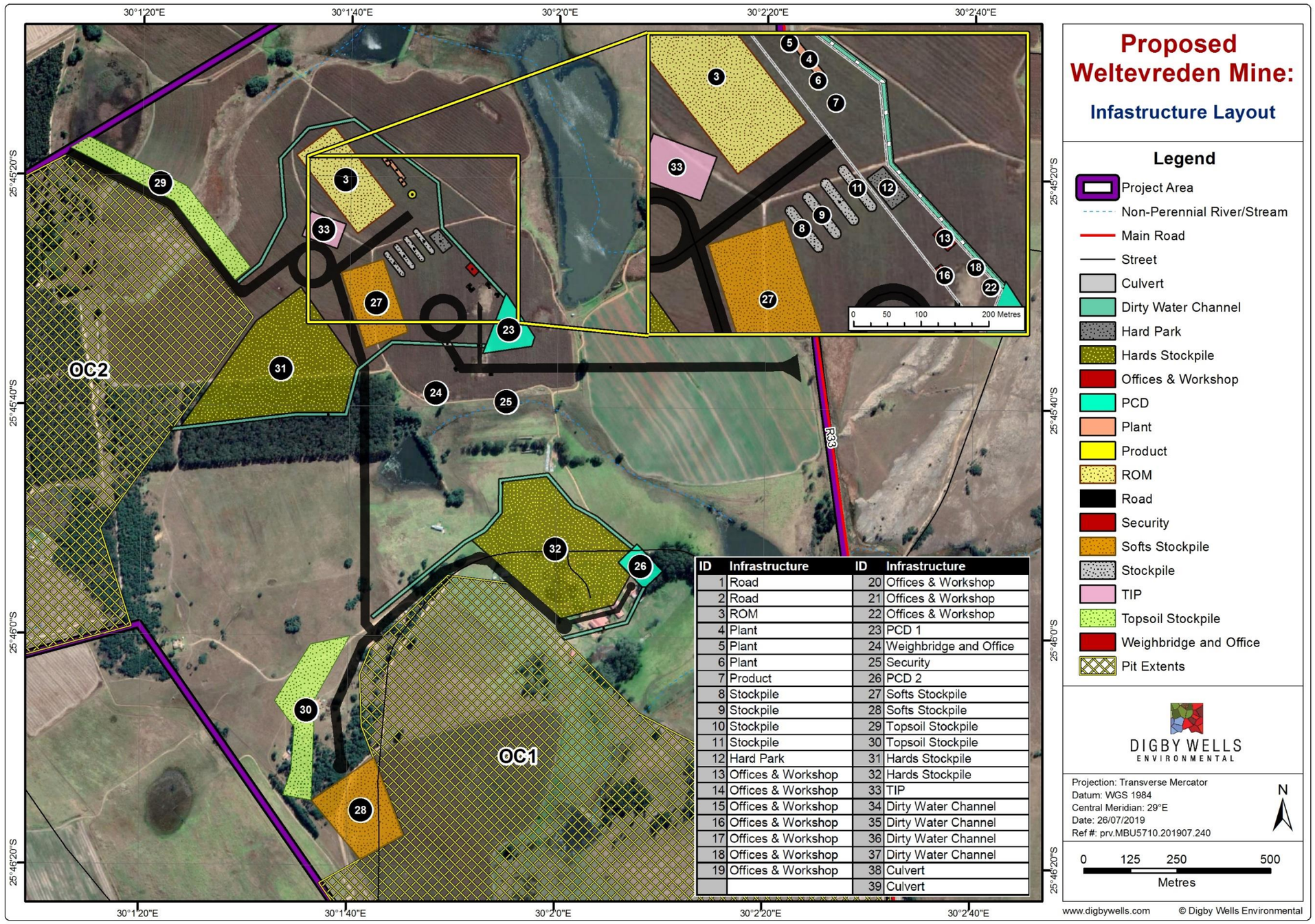
Please refer to Appendix 1 for the EAP's Curriculum Vitae (CV) and qualifications.

3 Item 2(b): Description of the Property

All proposed mining activities will take place on Portions 9, 12, 231 and the Remaining Extend of Portion 3 of the Farm Weltevreden 381 JT. The eastern portion of the proposed Mining Right will not be mined nor accommodate any mining-related infrastructure (refer to Figure 3-1). Xivono proposes to mine two pits, OC1(162 ha footprint) and OC2 (200 ha footprint) through open pit mining. Xivono plans to utilise containers for the mine offices and workshop infrastructure which will occupy a footprint of approximately 0.03 ha (300 m^2). Other infrastructure proposed for the site includes a pollution control dams, crushing and screening plant (no washing to take place on site), Run of Mine (RoM) pad, overburden dump, stockpiles, pipelines and lined trenches. The conceptual mine layout is currently being developed and the stormwater management infrastructure will be developed in the Environmental Impact Assessment (EIA) Phase of the Project. The surface infrastructure is expected to have a footprint of approximately 1 ha.

Table 3-1: Property Description

Farm Name:	Weltevreden 381 JT
Application Area (Ha):	Approximately 800 ha
Magisterial District:	Nkangala District Municipality
Distance and direction from nearest town:	Approximately 8 km south of Belfast
21 digit Surveyor General Code for each farm portion:	T0JT00000000038100012 T0JT00000000038100003 T0JT00000000038100009 T0JS00000000038100000



ID	Infrastructure	ID	Infrastructure
1	Road	20	Offices & Workshop
2	Road	21	Offices & Workshop
3	ROM	22	Offices & Workshop
4	Plant	23	PCD 1
5	Plant	24	Weighbridge and Office
6	Plant	25	Security
7	Product	26	PCD 2
8	Stockpile	27	Softs Stockpile
9	Stockpile	28	Softs Stockpile
10	Stockpile	29	Topsoil Stockpile
11	Stockpile	30	Topsoil Stockpile
12	Hard Park	31	Hards Stockpile
13	Offices & Workshop	32	Hards Stockpile
14	Offices & Workshop	33	TIP
15	Offices & Workshop	34	Dirty Water Channel
16	Offices & Workshop	35	Dirty Water Channel
17	Offices & Workshop	36	Dirty Water Channel
18	Offices & Workshop	37	Dirty Water Channel
19	Offices & Workshop	38	Culvert
		39	Culvert

Figure 3-1: Proposed Infrastructure Layout

4 Item 2(c): Locality Map

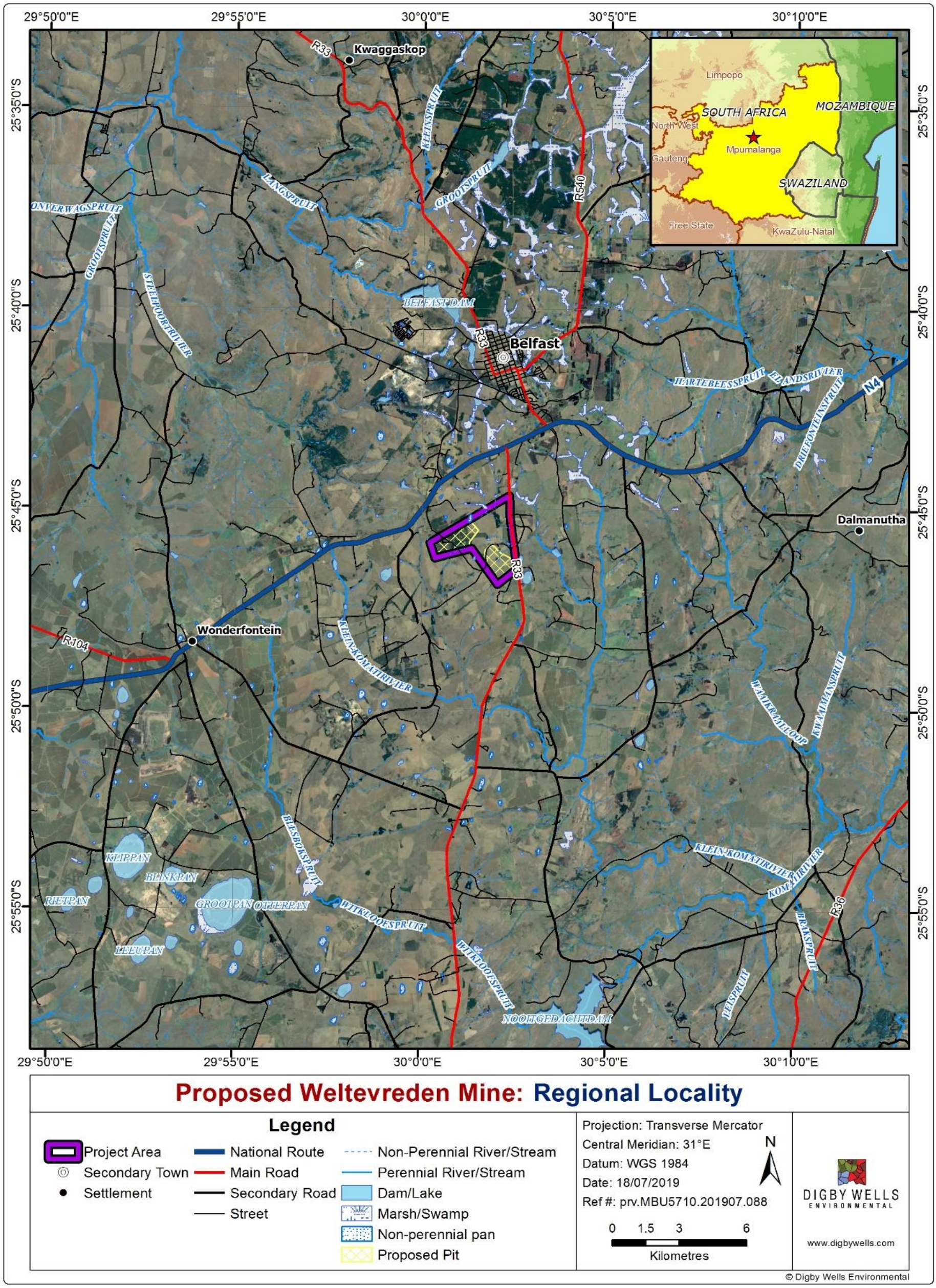


Figure 4-1: Project Local Setting

5 Item 2(d): Description of the Scope of the Proposed Overall Activity

The proposed infrastructure layout plan is attached in Appendix 2, and shown in Figure 3-1 above.

5.1 Listed and specified activities

Table 5-1 provides the Listed Activities required for authorisation in terms of the NEMA and NEM:WA, in relation to the mining activities and infrastructure requirements for the proposed mine.

Table 5-1: Listed and Specified Activities

Name of Activity	Extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Listing Notice 1				
All infrastructure including, change houses, offices, ablutions, workshops, weighbridge, weighbridge control room and access control office. *The development of-* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -* ***Excluding -*** *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	Approx. 1 ha of Infrastructure	X-1	GN R 983 under NEMA	
Construction of access and haulage road *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.*	Approximately 10km in total	X-24 *(ii)*	GN R 983, under NEMA	-

Name of Activity	Extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Pollution control dam *The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50,000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.*	PCD 1 = 11 659 m^2 PCD2 = 7 005 m^2	X- 13	GN R 983 under NEMA	-
Raw water pipeline *The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water-* *(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 bulk transportation of water or storm water or storm water drainage inside a road reserve; or* *(b) where such development will occur within an urban area.*	To be confirmed in EIA Phase	X-9 (i) and /or (ii)	GN R 983 under NEMA	-
Process water *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 bulk transportation of water or storm water or storm water drainage inside a road reserve; or* *(b) where such development will occur within an urban area.*	Dirty water channels = 7 000 m	X-10 (i) and or (ii)	GN R 983 under NEMA	-
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*	To be confirmed in EIA Phase	X- 11	GN R 983, under NEMA	-
Listing Notice 2				
Site/vegetation clearance *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* maintenance purposes undertaken in accordance with a maintenance management plan.	Approximately 20 ha	X-15	GN 984, under NEMA	-

Name of Activity	Extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Infrastructure construction *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;* *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.*	Mining area: 800ha	X- 17	GN R 984, under NEMA	-
Water Use Licence and Waste Management 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*	800 ha	X- 6	GN R 984 under NEMA	GN R 921 under NEM:WA Category B 4 (11)
Waste Activities				
Pollution control dam *The construction of a facility for a waste management activity listed in Category B of this Schedule*	PCD 1 = 11 659 m^2 PCD2 = 7 005 m^2		GN R 921 under NEM: WA	Category B 4 (10)
Stockpiling (rock dumps) *The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).*	Waste stored in stockpiles = 4 820 m^2	Category B 4 (11)	GN R 921 under NEM: WA	-
Rock removal (blasting), Stockpiling (rock dumps, soils, ROM, pipelines) *Mining, exploration or production operation, resulting in the development of residue stockpiles and residue deposits"* *Prospecting, mining, exploration or production operation, resulting in development of residue stockpiles and residue deposits. The management and control of these wastes must take place in accordance with the regulations for management and control of residue deposits and residue stockpiles or an integrated environmental authorization as provided for in terms of NEMA.*	800 ha	Category B; Listing 7, 10, 11	GN R 921 under NEM: WA	-

5.2 Description of the Activities to be undertaken

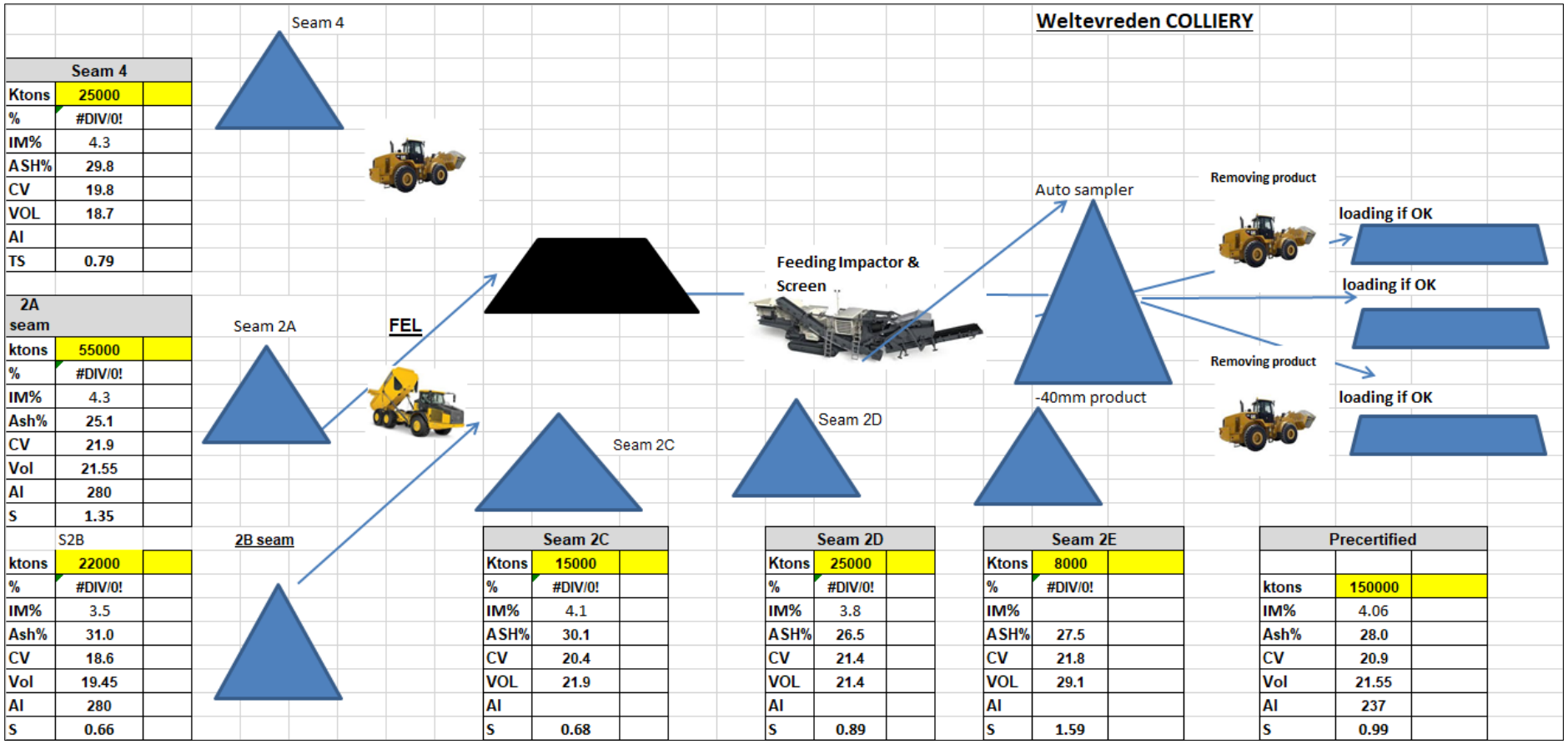
The below sections describe the proposed activities associated with the project. Refer to Figure 5-1 below, in support of the sections below.

5.2.1 Reserves and Product

Xivono proposes to mine two pits namely OC1 and OC2. OC1 has in excess of 5 million tonnes of in-situ minable tonnes at a depth of approximately 20 m below surface. OC1 will target the 2 Seam which is an average of 2.7 m thick. OC2 will target the Upper 4 Seam, Lower 4 Seam and 2 Seam which reaches a maximum depth of 30 m. OC2 will yield approximately 10 million tonnes of coal. The coal product will be for supply directly to Eskom. Coal from seams 2A, Seam 2D and Seam 2E are used as a blender to improve the inferior qualities coal from Seam 2B, 2C and Seam 4L where the blending ratio is 3:1.

5.2.2 Resource Access, Production and Scheduling

This application pertains only to open-pit mining for two pits. The total proposed quantity of coal to be extracted is approximately 15 million tonnes over a 15-year Life of Mine. Currently, Pit OC2 will be mined first with in an west-east direction and Pit OC2 will be mined thereafter in a south-north direction, with an assumed production rate of 150 000 tonnes of coal mined per month for the total pit area. Coal crushing and screening will take place on site and trucked directly to Eskom.



Seam 4		
Ktons	25000	
%	#DIV/0!	
IM%	4.3	
ASH%	29.8	
CV	19.8	
VOL	18.7	
AI		
TS	0.79	

2A seam		
ktons	55000	
%	#DIV/0!	
IM%	4.3	
Ash%	25.1	
CV	21.9	
Vol	21.55	
AI	280	
S	1.35	

S2B		
ktons	22000	
%	#DIV/0!	
IM%	3.5	
Ash%	31.0	
CV	18.6	
Vol	19.45	
AI	280	
S	0.66	

Seam 2C		
Ktons	15000	
%	#DIV/0!	
IM%	4.1	
ASH%	30.1	
CV	20.4	
VOL	21.9	
AI		
S	0.68	

Seam 2D		
Ktons	25000	
%	#DIV/0!	
IM%	3.8	
ASH%	26.5	
CV	21.4	
VOL	21.4	
AI		
S	0.89	

Seam 2E		
Ktons	8000	
%	#DIV/0!	
IM%		
ASH%	27.5	
CV	21.8	
VOL	29.1	
AI		
S	1.59	

Precertified		
ktons	150000	
IM%	4.06	
Ash%	28.0	
CV	20.9	
Vol	21.55	
AI	237	
S	0.99	

Figure 5-1: Coal Process Flow Diagram

6 Item 2(e): Policy and legislative context

This section aims to provide a description of the policy and legislative context within which the project is being proposed. This section has been divided into national, provincial and policies, plans, guidelines and development planning frameworks and tools. Table 6-1 provides a description of the national legislation and guidelines that is considered applicable to the Project and its activities.

Table 6-1: Policy and Legislative Context

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.*	Xivono 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 enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No 107 of 1998) and EIA Regulations (as amended in 2017) The Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA), as amended was set in place in accordance with Section 24 of the Constitution. Certain environmental principles under NEMA have to 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.*	Activities associated with the proposed mine are identified as Listed Activities in the Listing Notices (as amended) and therefore require environmental authorisation prior to being undertaken. This Scoping Report and proceeding EIA Report will be informed by the requirements of the NEMA and Regulations thereunder.

Applicable legislation and guidelines used to compile the report	Reference where applied
The EIA Regulation, 2014 was published under GN R 982 on 4 December 2014 (EIA Regulations) and came into operation on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R 983 (Listing Notice No. 1), GN 984 (Listing Notice No. 2) and GN R 985 (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.	
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) (MPRDA) 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 is the holder of a Prospecting Right and has applied for a Mining Right to mine on various portions the Farm Weltevreden 381 JT. The EIA process will be undertaken to meet the requirements of the MPRDA read with the EIA Regulations, 2014 (as amended). Financial Provisioning and Closure Costs will be included in the EIA.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) 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: Category A 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; Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA Regulations supporting a waste management licence application; and	A Waste Management Licence (WML) has been applied for due to the nature of mining activities.

Applicable legislation and guidelines used to compile the report	Reference where applied
Category C 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 R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification.	
National Water Act, 1998 (Act No. 36 of 1998) (NWA) 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 R 704 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.	An IWULA and an associated 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 DWS as the decision-making authority. The water uses under Section 21 of the NWA which may be relevant to this Project are listed below: ▪ S21(a) – Taking water from a water resource; ▪ S21(b) – Storing water; ▪ S21(c) – Impeding or diverting the flow of water in a watercourse; ▪ S21(i) – Altering the bed, banks, course or characteristics of a watercourse; ▪ S21(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and ▪ S21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource.

Applicable legislation and guidelines used to compile the report	Reference where applied
DWS[2] Best Practice Guideline – G1: Storm Water Management Plan (SWMP) 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.	All water management infrastructure will be designed for a 1:100-year, 24 hour rainfall event.
DWS Best Practice Guideline – G4: Impact Prediction The impacts of mine activities on the groundwater environment must be assessed as part of the MRA, 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.	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 the MRA will assess potential impacts on groundwater resources as a result of the Project.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) 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 also takes into account the	A Fauna and Flora Impact Assessment will be conducted as part of the EIA Phase which will include the characterisation of the natural habitat and provide mitigation measures that must be applied to sensitive habitats (if any are identified). Infrastructure associated with the Project has been placed

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

Applicable legislation and guidelines used to compile the report	Reference where applied
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 R.599 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 R.1002, 9 December 2011).	on already disturbed land as far as possible to reduce disturbance of natural vegetation
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) 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 DEA, 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 also 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.	An Air Quality Impact Assessment will be undertaken as part of the EIA Phase. The Project's activities will set out to abide by the NEM:AQA and standards set out in the NAAQS. The required mitigation will be included in the EMP as part of the EIA Phase.
National Dust Control Regulation 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 the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)(NEM:AQA). In the published National Dust Control Regulations, terms like target, action and alert thresholds	An Air Quality Impact Assessment will be undertaken as part of the EIA Phase. The Project's activities will set out to abide by the NEM:AQA and standards set out in the National Ambient Air Quality Standards (NAAQS). The

Applicable legislation and guidelines used to compile the report	Reference where applied
were omitted. Another notable observation was the reduction of the permissible frequency of exceedance from three to two incidences within a year. The standard actually adopted a more stringent approach than previously, and would require dedicated mitigation plans now that it is in force.	required mitigation will be included in the EMP as part of the EIA Phase.
National Noise Control Regulations, R.154 of 1992 (the Noise Regulations) promulgated in terms of Section 25 of the Environmental Conservation Act, 1989 (Act 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 make reference 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 particular development.	A Noise Impact Assessment, including modelling, impacts and proposed mitigation measures will be undertaken for the EIA Phase. Over and above the requirements set out in the NCR, a Blast Impact Assessment will also be undertaken.
The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) 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.	For the Scoping Phase, a Notice of Intent to Develop (NID) has been submitted to SAHRA. A Heritage Impact Assessment will form part of the EIA Phase.

Applicable legislation and guidelines used to compile the report	Reference where applied
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 R 548 (2000).	
GN R 1147 (Financial Provisioning Regulations), 2015 The Financial Provisioning Regulations 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 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, decommissioning and mine closure plan. This will be finalised and included in the EIA.
GN R 527 (MPRDA Regulations), 2004 Regulation 527 (GN R. 527) specifies that the EMP 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. R527 provides specific principles for mine closure including safety and health, residual and latent environmental impacts etc.	A preliminary EMP is provided in Section 11.3 of this report.
Integrated Development Plan Each municipality has an Integrated Development Plan (IDP) which considers all local municipality districts and the needs to be met in these districts.	This report considers the IDP for the Nkangala District Municipality, specifically with reference to the Emakhazeni Local Municipality where the proposed Project is based.

7 Item 2(f): Need and desirability of the proposed activities

The Integrated Environmental Management Guideline Series 9: Guideline on Need and Desirability was promulgated in terms of the EIA Regulations, 2010 in Government Notice 891 of 2014. The Department of Environmental Affairs (DEA) published an updated Integrated Environmental Management Guideline on Need and Desirability in 2017.

According to these guidelines, the consideration of "need and desirability" in EIA decision-making requires the consideration of the strategic context of the proposed projects along with the broader public interest and societal needs. The guidelines further state that the development must not exceed ecological limits and the proposed actions must be measured against the short-term and long-term public interest to promote justifiable social and economic development, essentially ensuring the simultaneous achievement of the triple bottom line (Social, Environmental and Financial sustainability).

7.1 Questions To Be Engaged With When Considering Need and Desirability

The latest Guideline Document 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. These questions (as per the Guideline) and answers to each are presented in Table 7-1.

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 will be assessed according to the Digby Wells impact assessment methodology
	1.1	How were the following ecological integrity considerations taken into account?	
	1.1.1	Threatened Ecosystems	The Project is located within the endangered Eastern Highveld Grassland vegetation type, with vulnerable, near threatened and protected floral species potentially occurring on site. A total of eight faunal and 23 avifaunal species potentially found in the project area are listed in the IUCN Red List of Threatened Species. This includes Critically Endangered (CR), Endangered (EN), Near Threatened (NT), and Vulnerable (VU) species. These have been listed in the preceding chapters.
	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 desktop investigation identified that the landscape comprises of bench depression and bench flat wetlands as well as hillslope seep wetlands. The identified wetlands were all Rank 6 wetlands in terms of the National Freshwater Ecosystems Priority Areas ranking system.

Theme	No.	Question	Response
	1.1.3	Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)	CBA's and ESA's have not been identified but this will be verified in the Impact Assessment Phase.
	1.1.4	Conservation targets	These will be considered during the Impact Assessment Phase and responded to accordingly.
	1.1.5	Ecological drivers of the ecosystem	
	1.1.6	Environmental Management Framework	
	1.1.7	Spatial Development Framework	The Nkangala District Municipality IDP, containing the SDF, was referenced for the compilation of this Scoping Report, and will be considered in the Impact Assessment Phase.
	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 NFEPA wetlands. No RAMSAR sites are present in the vicinity of the Project area. The EIA Phase will evaluate and provide recommendations in terms of South African Carbon Tax Compliance, and climate change management procedures as necessary.
	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	This will be investigated during the EIA Phase.

Theme	No.	Question	Response
		minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	
	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?	
	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	A desktop survey has been conducted for the Scoping Phase but the extent to which cultural heritage sites will/may disturbed will be investigated in the EIA Phase.

Theme	No.	Question	Response
		offsetting) the impacts? What measures were explored to enhance positive impacts?	
	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 be replaced with renewable energy, non-renewable energy sources will be required. The extent of any positive impacts associated with this Project will be investigated in the EIA Phase.
	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	The Scoping Phase has confirmed the presence of wetlands and the potential for extensive water management on site for the proposed mine due to groundwater disturbance. The extent of these impacts and potential mitigation can only be determined in the EIA Phase. It must be noted that avoidance of this impact would result in the No-Go alternative being implemented, as the coal seam is too shallow to motivate underground mining.

Theme	No.	Question	Response
		responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	
	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 waste they generate, without compromising their quest to improve their quality of life)	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 and Eskom is currently in a position (at the time of this report being written) to pay more for coal directly from South African mines than export coal did previously. The socio-economic impacts as a result of coal mining proceeding will be assessed in the EIA Phase.
	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 thus far.
	1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?	This will be investigated during the EIA Phase and responded to accordingly.

Theme	No.	Question	Response
	1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Gaps in knowledge, uncertainties and assumptions will be determined during the EIA Phase and presented in the EIA Report.
	1.8.2	What is the level of risk associated with the limits of current knowledge?	
	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:	This will be investigated and quantified by each specialist and presented in the EIA Phase.
	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?	

Theme	No.	Question	Response
	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 different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Alternatives in terms of infrastructure placement were investigated in the pre-application phase, through the identification of sensitive areas on site. Sensitive areas on site will be avoided as far as possible, however, the OC1 pit will impact wetlands currently present within the proposed OC1 footprint.
	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 will be investigated and presented during the EIA Phase.
"pr om	2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	

Theme	No.	Question	Response
	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 Nkangala District Municipality IDP into consideration. The IDP presents issues and requests raised by residents in each local municipal district of the Nkangala Municipality. Once of the identified requests from the community is for the Municipality to be more involved with mining applications and to facilitate job creation for local residents at mining operations in each ward or local municipality.
	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 Municipality IDP.
	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 few job opportunities; however, the positive impact from the Project will be recognised through implementing the Community Development Projects as presented in the SLP.

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?	Yes, LED initiatives and skills development form part of the identified Community Development Projects as included in the SLP.
	2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Xivono 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?	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 Life of Mine of 15 years and therefore will not present any long-term sustainable employment, and therefore the SLP initiatives must provide long-term sustainable projects that the community can adopt and manage.
	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,	The mine will employ a total of 154 employees for the Weltevreden operation.
	2.5.2	reduce the need for transport of people and goods	

Theme	No.	Question	Response
	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),	Coal product will be trucked directly to Eskom. Xivono will also provide employee transport to and from the mine thereby mitigating increased traffic for individual road users.
	2.5.4	compliment other uses in the area,	A Traffic Impact Assessment will be undertaken in the EIA Phase which will establish potential congestion on surrounding roads and provide mitigation measures to manage the impact.
	2.5.5	be in line with the planning for the area,	The proposed Life of Mine is 10 to 15 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.
	2.5.7	optimise the use of existing resources and infrastructure,	No infrastructure is available on site which can be utilised as part of the mining operation; however, the proposed infrastructure on site will all be removed during decommissioning and will therefore not create unwanted infrastructure either.
	2.5.8	opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk	No bulk infrastructure will form part of this development.

Theme	No.	Question	Response
		infrastructure planning for 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 fairly rural 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 Community Development projects associated with the SLP will prioritise Historically Disadvantaged South Africans as beneficiaries.
	2.5.11	encourage environmentally sustainable land development practices and processes,	Not applicable.
	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 coal resource.
	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 returns to the community will be assessed during the EIA Phase.
	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	The impact to cultural heritage will be investigated during the EIA Phase.

Theme	No.	Question	Response
	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?	Not applicable.
	2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	Socio-economic impacts will be investigated during the EIA Phase.
	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 will be determined during the EIA Phase and presented in the EIA Report.
	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?	
	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	

Theme	No.	Question	Response
		impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	A Social Impact Assessment will be conducted during the EIA Phase which will consider the extent and significance of the proposed impacts presented in this section.
	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 practicable environmental option" to be	

Theme	No.	Question	Response
		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 I&AP database has been developed to identify and verify the directly and indirectly affected landowners or land occupiers as well as the potentially affected surrounding communities.
	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 will be erected in various locations around the site

Theme	No.	Question	Response
			and in the nearest communities, SMS notifications will be utilised to provide progress reposts to I&APs as well as Digby Wells contact information for further consultation. Public meetings will be held in both the Scoping and EIA Phases 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.
	2.13.3	ensure participation by vulnerable and disadvantaged persons,	Site notices will be placed and a meeting held in areas easily accessible to the most disadvantaged affected community. The Background Information Document will be translated from English into isiZulu and a translator will also attend all public meetings to fully engage with all affected stakeholders.
	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 a 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, Xivono will establish community forums with guidance form the Municipality.

Theme	No.	Question	Response
	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.
	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.
	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)?	

Theme	No.	Question	Response
	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	Xivono 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,	A total of 154 employment opportunities will be created as a result of the Project proceeding. 20 additional positions will be created on a project basis.
	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),	Provision has been made in the Social and Labour Plan (SLP) to address some of the skills required for the operation, specifically for low-level skills development.
	2.16.3	the distance from where labourers will have to travel,	One hundred and ten semi-skilled job opportunities will be created as a result of the Project, however, it is too early in the process to confirm from what distance labourers will be required to travel, as the labour force has not yet been appointed. Xivono is committed to source labour from the nearest affected community and only search beyond the
	2.16.4	the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	

Theme	No.	Question	Response
			constraints of the immediate employment catchment zone if the skills required cannot be accommodated.
	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 number of farm workers who may be displaced should the Project proceed will be determined during the EIA Phase.
	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	Digby Wells has identified the relevant government organisations which must be consulted throughout the EIA Process. Furthermore, this application is in terms of the One Environmental System and Digby Wells shall endeavour to align the various procedures to reduce stakeholder fatigue.
	2.17.2	that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	Not applicable to this Project.
	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?	As part of the EIA Process, Financial Liability for the Applicant will be calculated to determine the cost of decommissioning and rehabilitating the mine site to an end-land use which is sustainable and in the best interest of both the surrounding communities and the environment.

Theme	No.	Question	Response
	2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	
	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 full mining area.
	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 will be assessed during the EIA Phase and presented in the EIA Report.

8 Item 2(g): Period for which the environmental authorisation is required

The proposed Life of Mine for the Project will require Environmental Authorisation for a period of 15 years.

9 Item 2(h): Description of the process followed to reach the proposed preferred site

The location of the Project has been decided by the location of the identified coal seams. Xivono undertook prospecting activities on the affected farm portions, and determined the pit areas based on the location of coal.

9.1 Item 2(h)(i): Details of all alternatives considered

9.1.1 Design and Layout of the Project

A sensitivity map was produced in the pre-application phase of the Project to determine “no-go” areas on site. This has informed the development of the mine infrastructure layout plan to significantly reduce impacts prior to the impact assessment being conducted.

9.1.2 Mining Method Alternatives

The proposed alternatives for coal extraction consider underground versus open pit mining. The coal seams within the Project area are too shallow to warrant underground mining and therefore open pit mining is the preferred alternative.

9.1.3 Transportation of Coal

The coal product from this proposed mining operation will be trucked directly to Eskom, and a Traffic Impact Assessment will be conducted during the EIA Phase, whereby various route alternatives will be provided and a recommendation on the preferred alternative will be presented for consideration.

9.1.4 The “No-Go” Alternative

The no-go alternative entails maintaining the status quo. The current land use is primarily farming. The no-mining option will result in the continuation of such land use. The preliminary impacts identified and understanding of the overall sensitivity of the site will then be avoided, however; the benefit of Eskom receiving coal from the proposed project will in turn not be realised.

9.2 Item 2(h)(ii): Details of the public participation process followed

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

- Stakeholders (including Government Departments, landowners, land occupiers, communities, Non-Governmental Organisations, 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 Scoping Report and associated documentation is available for public comment for a period of 30 days;
- Consultation with I&APs will be undertaken; and
- Suggestions and concerns will be obtained from I&APs.

Table 9-1 provides more detail regarding the Stakeholder Engagement activities undertaken thus far, together with referencing materials.

Table 9-1 Public Participation Scoping Phase Activities

Activity	Details
Identification of stakeholders	A stakeholder database was developed which includes I&APs from various sectors of society, including directly affected and adjacent landowners, in and around the proposed project area.
Distribution of announcement letter and Background Information Document	A BID, announcement letter with Registration and Comment Form was emailed and posted to stakeholders on **04 August 2019.**
Placing of newspaper advertisement	An English advert was placed in the Middelburg Observer on **02 August 2019**.
Putting up of site notices	English site notices were put up at the proposed project site, local libraries and municipal offices on **02 August 2019** at different locations around the Project site. *A site notice placement map and report was also developed to indicate the various site notice locations.*

Activity	Details
Announcement of Scoping Report	Announcement of availability of the Draft Scoping Report was emailed and posted to stakeholders together with the formal project announcement on **05 August 2019**. Copies of the Scoping Report are available at: ▪ Emakhazeni Public Library (Belfast) ▪ Siyathuthuka Library A SMS was also sent to stakeholders on **05 August 2019** announcing availability of the Scoping Report. The Scoping Report is also available on www.digbywells.com (Public Documents) and will be made available the Public Meeting. ***(30-day comment period for the Scoping Report: 05 August to 06 September 2019)***
Stakeholder Meeting	A Public Meeting will be held during the Scoping Phase.
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders will be captured in the CRR.

9.3 Item 2(h)(iii): Summary of issues raised by I&APs

This section will be populated in the Final Scoping Report, once comments and responses have been received from the public. All comments and responses which are received during the 30-day public comment period, as well as comments received prior to the Final Scoping Report being printed, will be included herein.

10 Item 2(h)(iv): The environmental attributes associated with the sites

This section comprises the baseline environment of the proposed mine as assessed by the relevant specialists. This includes the features of the environment on site and land use which is expected to be affected by the proposed Project.

10.1 Topography and drainage

The topography on the proposed Mining Right shows higher elevations along the western, northern and eastern site boundaries with gentle slopes ranging directly towards the south-south-eastern part of the site. Elevations range between ~1905 and 1805 metres above mean sea level (mamsl) with the highest elevations at the north-western part of the site and lowest elevations at the south-eastern part of the site. Refer to Figure 10-1.

Drainage on-site follows the general topography and consists of a number of farm dams interconnected by two non-perennial streams. These streams flow across the eastern part of the site in a general north to south-eastern orientation. The non-perennial streams join and

flow off-site near the south-eastern site corner and flow into the Klein-Komati stream south of the site.

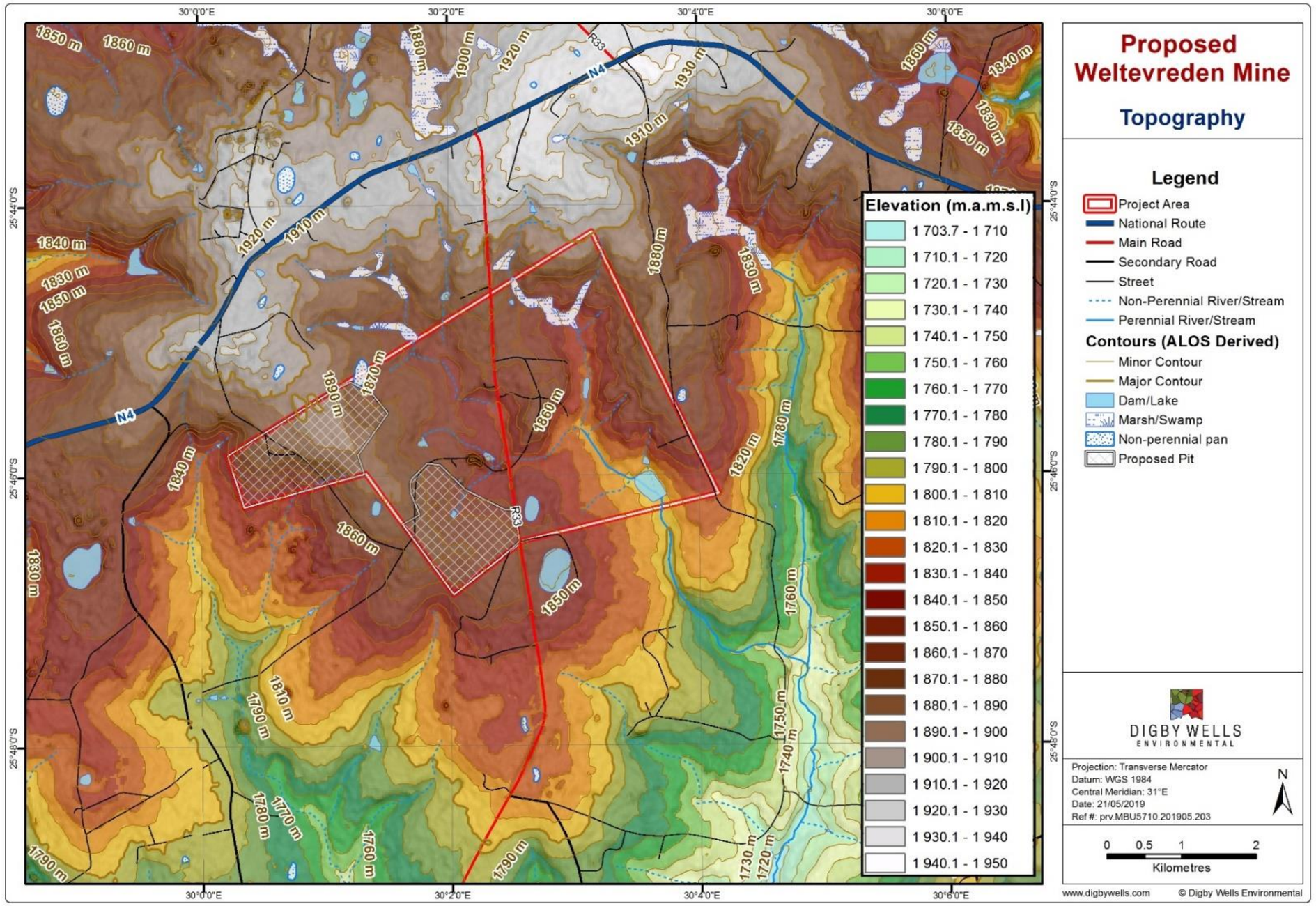


Figure 10-1: Topographical Map

10.2 Geology

This section provides both the regional and site-specific geology.

10.2.1 Regional geology

The site is situated along the northern boundary of the Karoo basin where the major lithostratigraphic units of the Karoo Supergroup crop out. The major formation underlying the site and surroundings is the Vryheid Formation which in the study area pinches out towards the north. The uneven pre-Karoo topography along the northern margin of the basin, where the formation overlies the Dwyka Formation or pre-Karoo rocks, gives rise to marked variations in thickness (Johnson et. al, 2006).

The Vryheid Formation consists of alterations of sandstone, siltstone, mudstone, shale including a number of coal seams which are the primary target for coal mining. As the Vryheid formation regionally pinches out towards the north, pre-Karoo rocks outcrop at surface in the region. Generally, the higher topography is underlain by sedimentary rocks of the Vryheid Formation whereas the lower lying areas, where these sediments have been eroded away, exposes the pre-Karoo (predominantly metasedimentary) rocks or diamictites of the Dwyka formation.

The study area is underlain by pre-Karoo rocks with a general south-west to north-east orientation which mainly belong to the Pretoria Group:

- Steenkampsberg Formation - quartzite with interlayered arenite, shale and conglomerate;
- Nederhorst Formation - hornfels overlain by arenite;
- Lakenvlei Formation - feltspathic quartzite with conglomerate and grit;
- Vermont Formation - hornfels with layers of silt and sandstone, carbonate and calc-silicate rocks;
- Magaliesberg Formation - quartzite with some shale layers; and
- Lydenburg member of the Silverton Formation (shale and mudstone with interlayered carbonate layers).

The geological map furthermore indicates potential faulting and/or dykes in a SW-NE orientation and local outcrops of sill-type diabase intrusions.

10.2.2 Local geology

The site itself is predominantly underlain by the Vryheid Formation. Exploration drilling at the site indicates the thickness of the Vryheid Formation is highly variable over short distances with depths between 21 and 81 metres below ground level (mbgl) for the north-western part of the site and between 16 and 47 mbgl for the south-western part of the site.

The targeted coal seams, as part of the Vryheid Formation, are the 2, 3, 4S and 4L Seams with the 2 Seam identified at the south-western part of the site and the 2, 3, 4S and 4L seams identified at the north-western part of the site. Depth to coal within the OC1 and OC2 pits are between 12 and 54 mbgl, with the deepest point towards the northern site boundary, and between 6 and 38 mbgl, with the lowest point along the south-western site boundary.

The Vryheid Formation is unconformably underlain by diamictite of the Dwyka Group, which in turn unconformably overlies Pre-Karoo rocks and diabase intrusions. It outcrops at surface to the west of the site and was intercepted at depth in most exploration holes.

Based on the exploration borehole logs lithologies underlying the Vryheid Formation were identified as diabase, granite and quartzite. Diabase is similar to dolerite and rocks of this nature indicate sill-type intrusions that occur mainly along bedding planes in the Karoo lithologies and at the contact between Karoo and pre-Karoo rocks. Sill type intrusions were also indicated on geological maps at surface north and north-east of the site. Based on the regional geology the presence of basement granites near the site is unlikely, and it could be that coarse-grained diabase or dolerite was interpreted as being granitic rock.

Outcrops of quartzite of the Lakenvlei Formation and diabase sills are present at the eastern half of the site, and exploration drilling shows quartzite underlying the Karoo lithologies along the south-eastern part of the site, in line with the presence of the Lakenvlei formation and the south-west to north-east orientation of the pre-karoo formations (Refer to Figure 10-2).

The presence of dyke-type intrusions was also observed by the interception of mainly dolerite in some borehole logs. The dykes will likely follow the south-west to north-east orientation of the geological units and linear features as indicated on the geological map below.

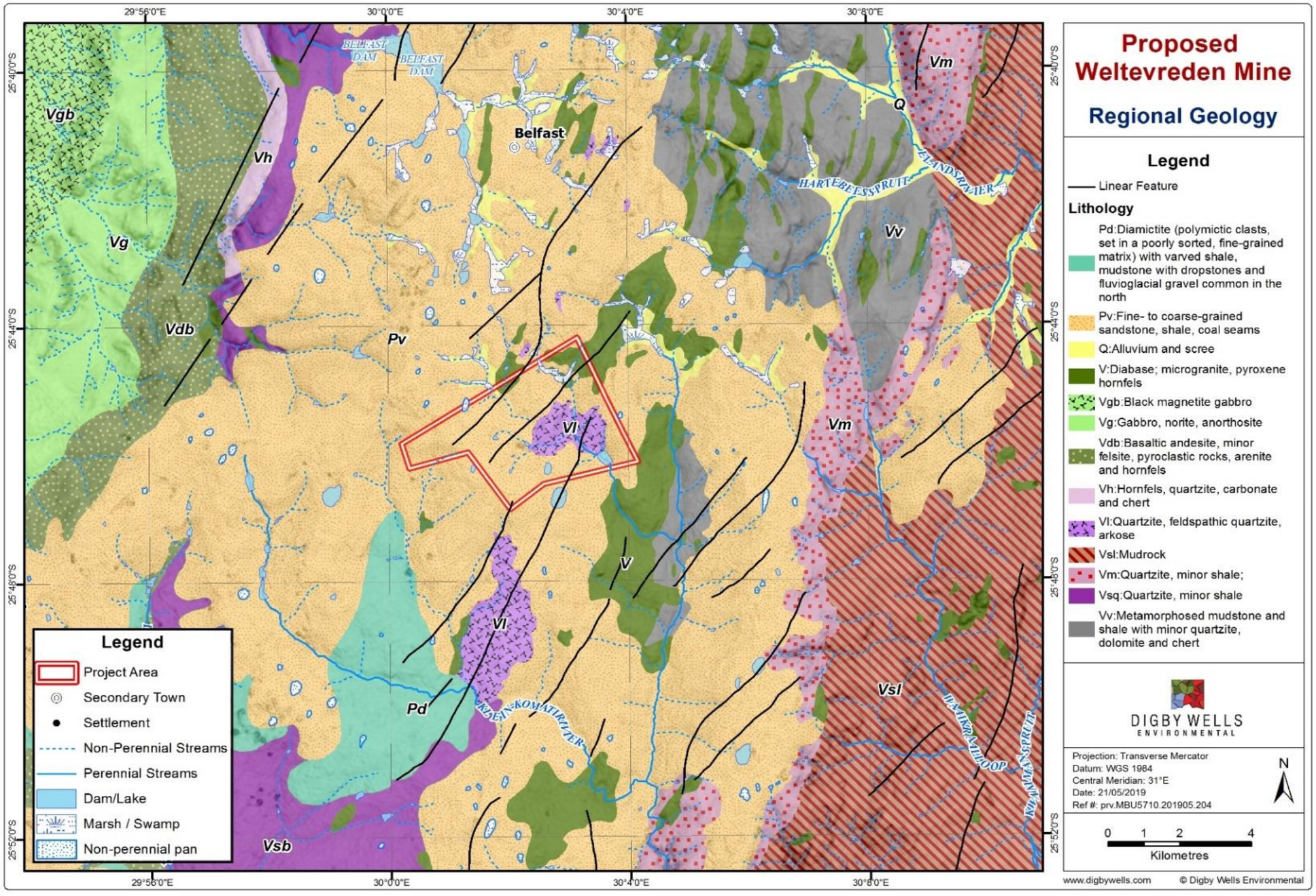
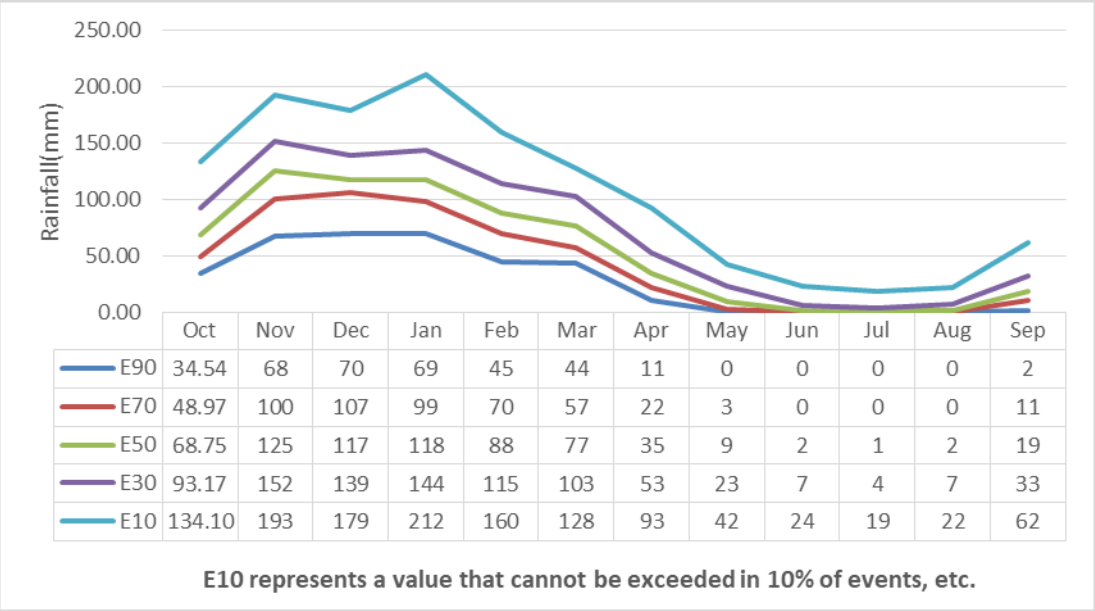


Figure 10-2: Regional Geology

10.3 Climate

The project site is characterised by warm and temperate climate with dry winters and warm summers. The precipitation of the driest month in winter is less than 1 tenth of the wettest month precipitation in summer (Cannon, 2011). The Mean Annual Precipitation (MAP) of region is 742.06 mm which is likely to be distributed as indicated in Figure 10-3. The normal rainfall (70% of the events) for the wettest month will likely not exceed 99 mm, while extreme rainfall (10% of the events) will likely not exceed 212 mm. This implies that the region experiences moderate to high rainfall.

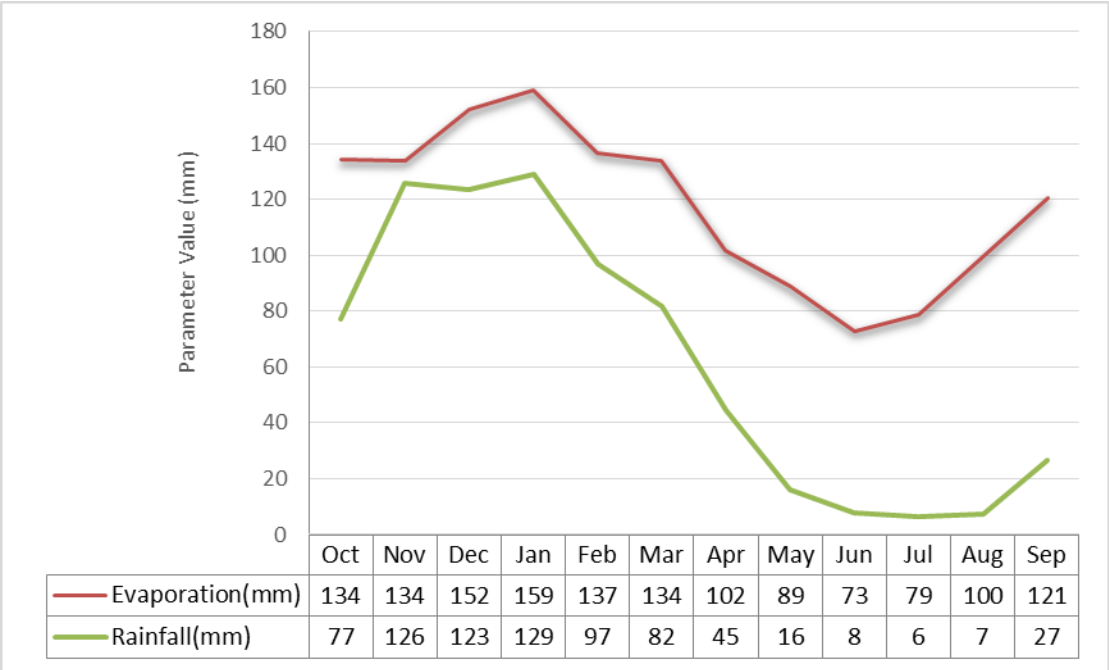


	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
E90	34.54	68	70	69	45	44	11	0	0	0	0	2
E70	48.97	100	107	99	70	57	22	3	0	0	0	11
E50	68.75	125	117	118	88	77	35	9	2	1	2	19
E30	93.17	152	139	144	115	103	53	23	7	4	7	33
E10	134.10	193	179	212	160	128	93	42	24	19	22	62

E10 represents a value that cannot be exceeded in 10% of events, etc.

Figure 10-3: Monthly Rainfall Distribution for Quaternary X11D

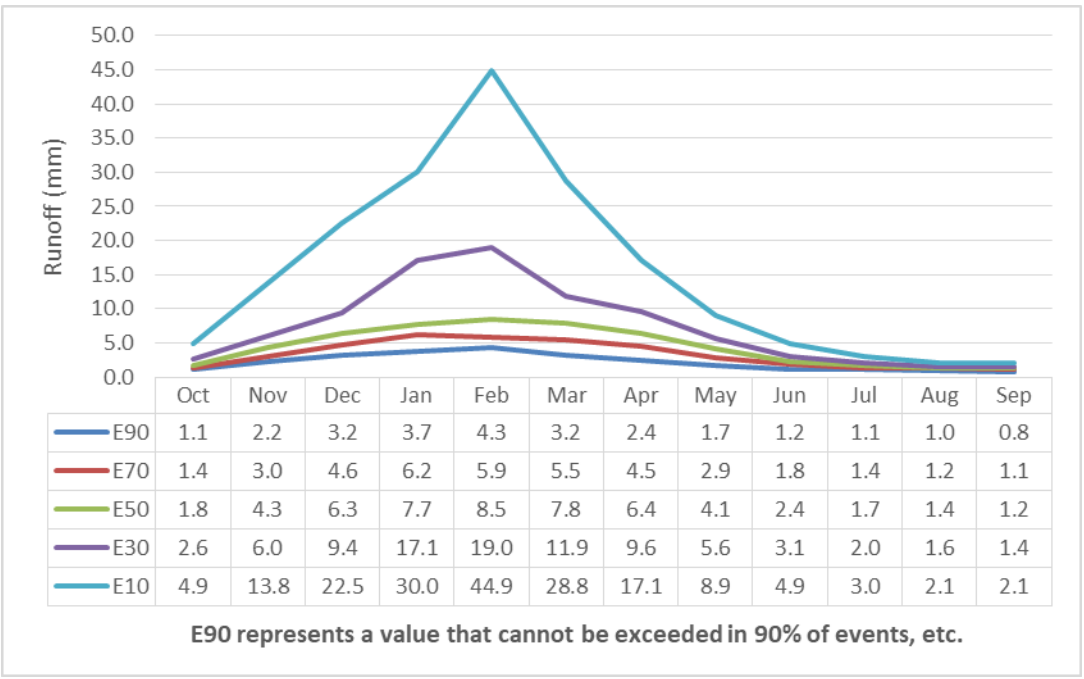
The Mean Annual Evaporation (MAE) for the X11D quaternary catchment is 1413.5 mm (WRC, 2015). The region clearly experiences higher evaporation than precipitation, giving rise to dry winters and wet summers with a negative natural water balance. The monthly distribution of potential evaporation and rainfall can be seen in Figure 10-4.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation(mm)	134	134	152	159	137	134	102	89	73	79	100	121
Rainfall(mm)	77	126	123	129	97	82	45	16	8	6	7	27

Figure 10-4: Monthly evaporation and rainfall for quaternary X11D

The Mean Annual Runoff (MAR) depth for the area was calculated to be 80.91 mm. This runoff accounts for approximately 7.4% of the MAP for the area. The 90th and 10th percentiles of runoff during the wettest month of December are 3.2 mm and 22.5 mm, respectively. The MAR is likely to be distributed as indicated in Figure 10-5.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
E90	1.1	2.2	3.2	3.7	4.3	3.2	2.4	1.7	1.2	1.1	1.0	0.8
E70	1.4	3.0	4.6	6.2	5.9	5.5	4.5	2.9	1.8	1.4	1.2	1.1
E50	1.8	4.3	6.3	7.7	8.5	7.8	6.4	4.1	2.4	1.7	1.4	1.2
E30	2.6	6.0	9.4	17.1	19.0	11.9	9.6	5.6	3.1	2.0	1.6	1.4
E10	4.9	13.8	22.5	30.0	44.9	28.8	17.1	8.9	4.9	3.0	2.1	2.1

E90 represents a value that cannot be exceeded in 90% of events, etc.

Figure 10-5: Monthly runoff distribution for quaternary X11D

Meteorological baseline data such as precipitation, wind speed, temperature and humidity were extracted from Weatherbase (2019) and the results are given as below.

10.3.1 Precipitation

The average amount of precipitation for the year in Belfast is 838.2 mm and results are given in Figure 10-6, where the most precipitation on average is January recorded at 162.6 mm. July was found to be the month with the least precipitation on average of 5.1 mm. During the year, an average of 86.3 days of precipitation was recorded with the most precipitation (rainfall days) occurring in November with 13.9 days and the least precipitation occurring in July with 1.1 days (Figure 10-7).

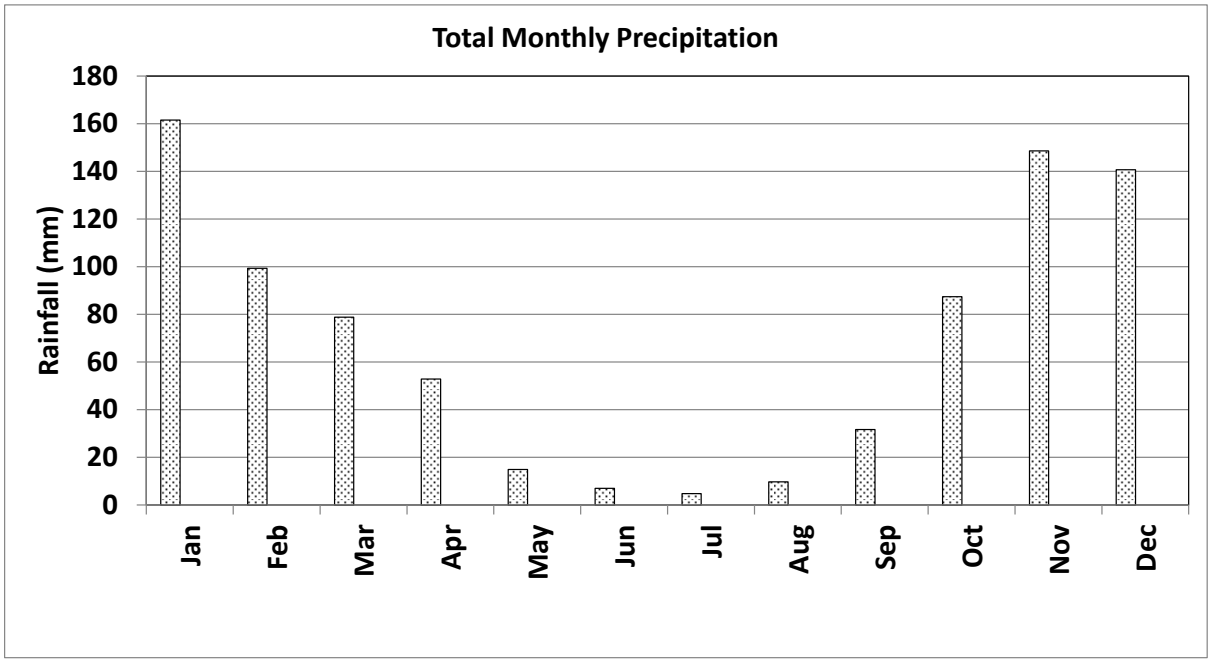


Figure 10-6: Total Monthly Precipitation

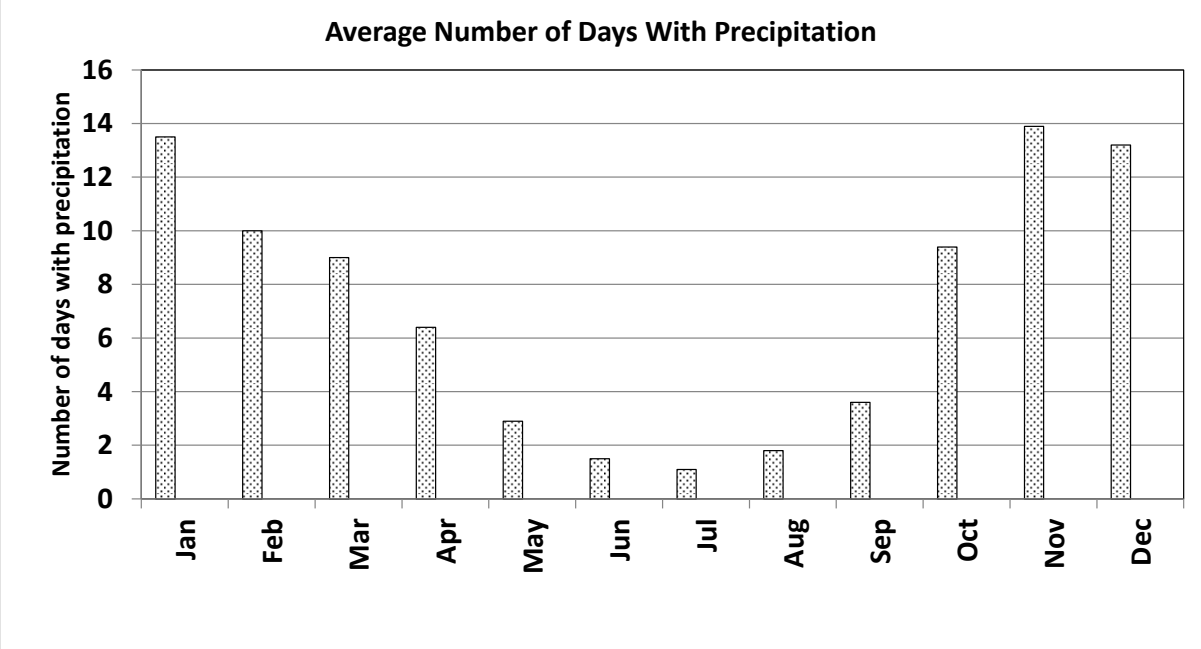


Figure 10-7: Average number of days with precipitation

10.3.2 Wind Speed

One of the factors that favour the suspension and resuspension of loose particulates in the atmosphere is the intensity of the wind speed regime. Wind speed greater than 5.4 m/s leads to erosion of loose dust, Particulate Matter and the degree of dispersion across the landscape. The monthly wind speed average is shown in Figure 10-8 with less than 5.4m/s which predicts lower risk (probability) of dust generation based on the average wind speed.

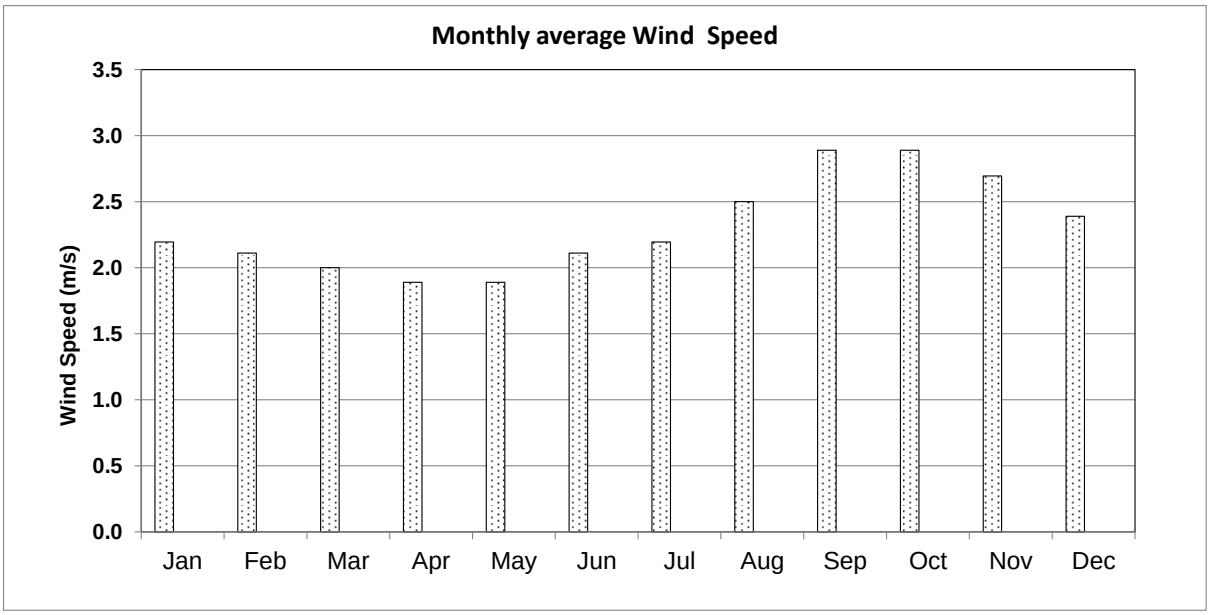


Figure 10-8: Monthly Average Wind Speed

10.3.3 Temperature and Humidity

The annual average temperature in the project area is 14.4°C with January as the warmest month reaching 18.2°C, while the coolest month on average is June, with an average temperature of 8.8°C. The annual average humidity is 61.7 % with January as the highest humidity month at 70% and August presenting the lowest level at 50%. The average temperature and the humidity for the Project area is represented graphically in Figure 10-9.

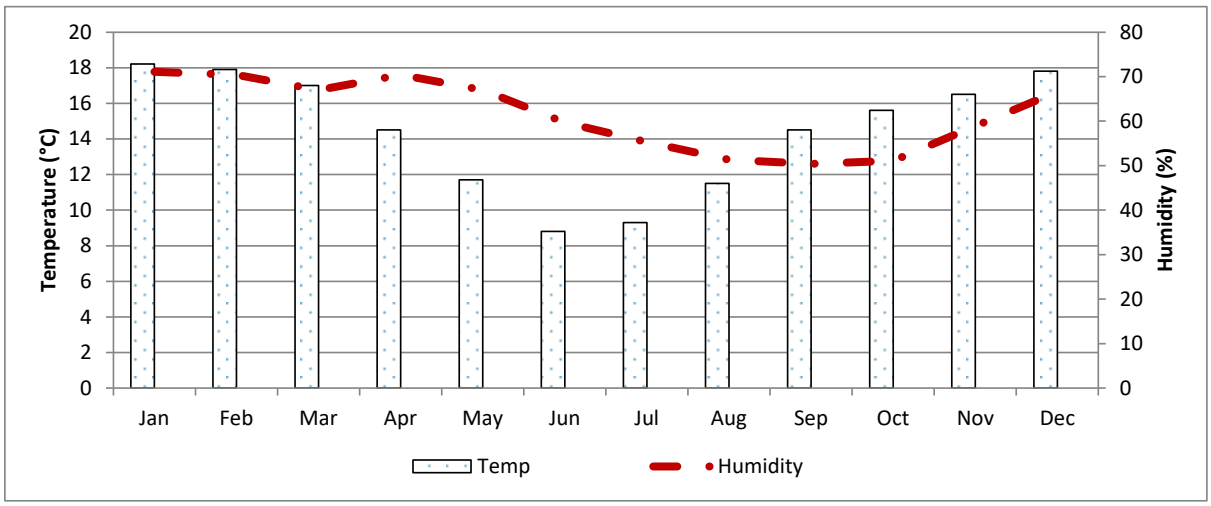


Figure 10-9: Temperature and Humidity

10.4 Surface Water

South Africa is divided into nine Water Management Areas (WMA) (Revised National Water Resource Strategy, 2012), managed by their own water boards. Each of the WMAs is made up of quaternary catchments which relate to the drainage regions of South Africa, ranging from A to X (excluding O). These drainage regions are subdivided into four known divisions based on size. For example, the letter A represents the primary drainage catchment; A2 for example will represent the secondary catchment; A21 represents the tertiary catchment and A21D would represent the quaternary catchment which is the lowest subdivision in the Water Resources of South Africa, 2012 manual. Each of the quaternary catchments has associated hydrological parameters.

The project site is situated within the Inkomati-Usuthu Water Management Area (WMA 3) and in quaternary catchment X11D as revised in the 2012 water management area boundary descriptions (RAS Government Gazette No. 35517, 2012). The farm Weltevreden is located on a watershed. The Klein-Komati River and its tributaries drain the area in a southerly direction joining up with the Komati River further downstream before flowing eastwards towards the Indian Ocean. The Langspruit flows to the north while the Steelpoort River flows in the northwest direction from the Weltevreden project site (see Figure 10-10).

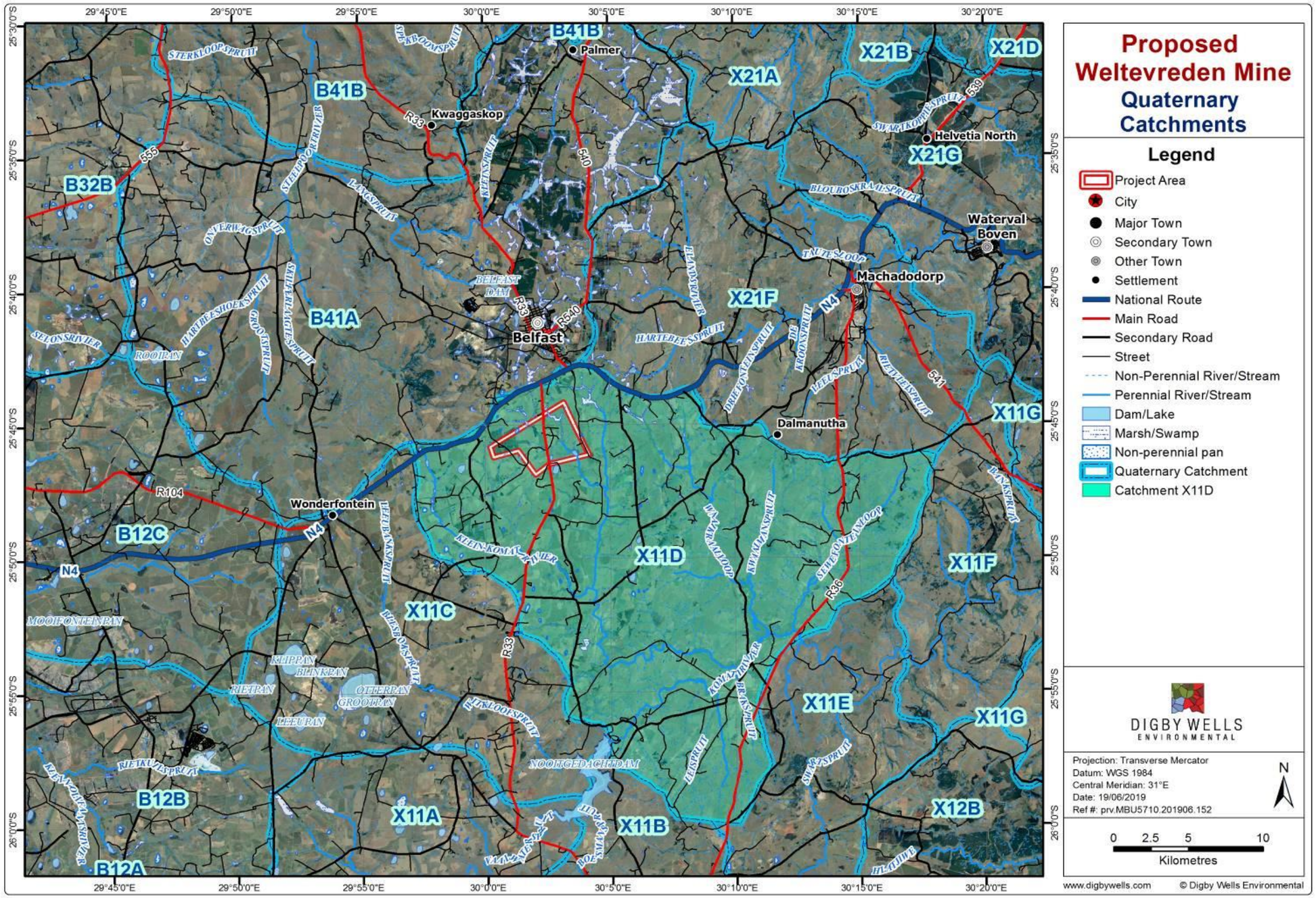


Figure 10-10: Hydrological setting of the Weltevreden project site

10.4.1 Sensitivity Assessment

The X11D quaternary catchment is drained by Witkloofspruit and Klein Komati Rivers. These rivers flow in a south-easterly direction joining the Komati River. In addition to the aforementioned rivers, there are wetlands and pans that constitute sensitive water features within and around the Weltevreden project site (Figure 10-11). These water resources are sensitive to developmental impacts and due care should be taken to ensure that they are protected from degradation. Headwater wetlands within the project site are suspected to maintain low flows in adjacent streams/rivers within this area, especially during the dry season. Disturbing these wetlands will likely impact on streamflow regime, thereby affecting downstream water users. Ecological systems are also affected by disturbing the water resources and the highly sensitive ecological areas are indicated in Figure 10-11. Mechanisms and management measures should be put in place to ensure that no water quality and quantity deterioration or any form of degradation occurs as a result of mining and related activities.

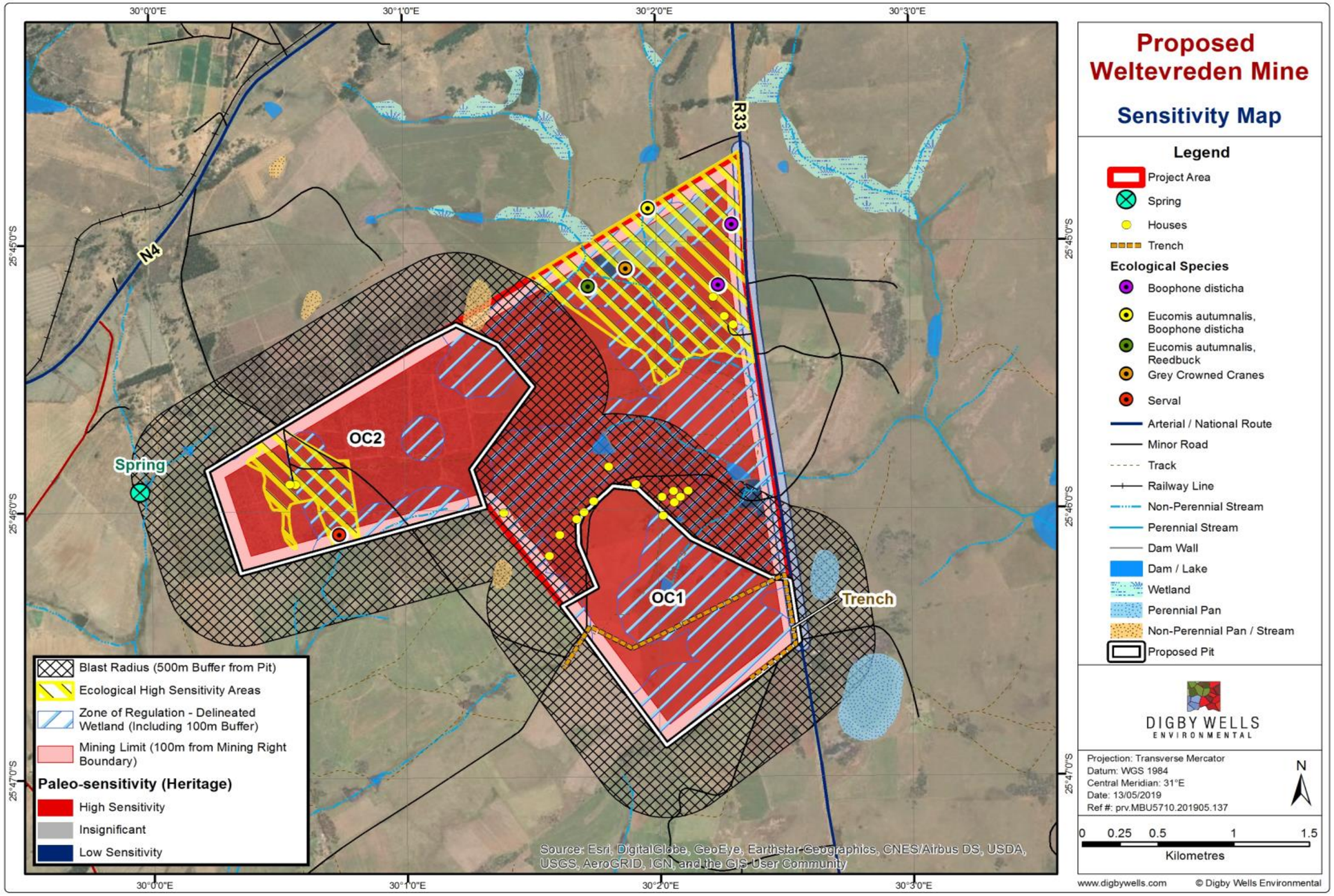


Figure 10-11: Combined surface water, ecological and paleo-sensitivities at the Weltevreden project site

10.5 Groundwater

The conceptual hydrogeological model of the area is based on the generally accepted model for the Mpumalanga coal fields. In this model three principal aquifers are identified:

- The weathered Karoo aquifer;
- The fractured Karoo aquifer; and
- The fractured pre-Karoo aquifer (Hodgson and Krantz, 1998).

The Karoo rocks are not known for large scale development of aquifers, but occasional high-yielding boreholes can be present. The aquifers that occur in the area can therefore be classified as minor aquifers (low yielding), but of high importance (Parsons, 1995) and are understood to have a low to medium development potential, mostly used for small-scale domestic purposes or occasionally for large-scale irrigation.

Three distinct superimposed groundwater systems are present within the area (Hodgson and Krantz, 1998, Woodford and Chevallier, 2002) and can be classified as:

- The upper weathered Ecca aquifer (shallow, intergranular type aquifer formed in the weathered zone of the Karoo sediments; can locally form a perched aquifer on top of fresh bedrock);
- The fractured aquifers within the unweathered, fractured Ecca sediments; and
- The aquifer below the Ecca sediments (deeper aquifer formed by fracturing of pre-Karoo sediments and dolerite intrusions).

These types of groundwater systems are common to the groundwater regime in the Karoo environment. The systems do not necessarily occur in isolation and often form a composite groundwater regime that is comprised of one, some, or all of the systems. Based on the exploration drilling at the site all three aquifer types are present at the site.

In general, the shallow Karoo weathered aquifer depth ranges between 5-20 m overlying the fractured Karoo rock formations throughout the region. This is in line with the results from the on-site exploration drilling, which indicates that the depth of the highly and moderately weathered Karoo aquifer varies between 3 and 20 mbgl with an average of ~8 mbgl. In terms of pollution risk and/ or susceptibility to pollution, the shallow primary aquifer is understood to be highly susceptible to pollution due to coal mining in the area as the pollutants travel shorter distance to reach the aquifer system (Hodgson and Krantz, 1998). Low-lying wetlands, where groundwater levels are close to the surface, can indicate interaction between groundwater and surface water and can also serve as conduits for potential contamination.

The depth of the fractured Karoo aquifer is variable and depth to pre-Karoo lithologies were measured between 20-80 mbgl for the north-western part of the site and between 15 and 50 mbgl for the south-western part. Good hydraulic connectivity often exists between the two Karoo aquifers and as such they are treated as a single unit in the modelling of groundwater flow-related systems.

Some of the identified wetlands (refer to wetland Section 10.6) are associated with changes in geology. East of the proposed mining areas quartzites of the pre-Karoo Lakenvlei Formation are close to surface in a low-lying area where the Vryheid Formation has been eroded away. The wetland associated with this outcrop indicates the low aquifer potential of the underlying quartzite which is likely causing the local accumulation of water in this area which is then discharged into the associated stream that flows in a general south-south-eastern direction. Another wetland just north of the site is likely associated to an intruded sill. Other wetlands are related to Karoo sediments and were indicated to be related to hillslope seepages and unchanneled valley bottoms.

10.5.1 Hydrocensus

Refer to a summary of locations identified during the hydrocensus in Table 10-1 and Table 10-2. The parameters tested are shown in Table 10-2, and the groundwater levels measured are shown in Table 10-3. Although many boreholes were identified for the hydrocensus, not all were sampled. Boreholes that were sampled were selected to best represent the area. Refer to Figure 10-12 for a complete depiction of boreholes identified and those that were sampled. The following conclusions were drawn from the hydrocensus:

- Groundwater is the main source of drinking water supply in and around the proposed mining area;
- A natural spring was identified west of pit OC2 (north-west of the mining right area) which is used for commercial bottled water;
- Groundwater is abstracted with the use of submersible pumps and in one instance a windmill, supplemented by a number of handpumps which are mainly used for domestic purposes by local communities;
- The windmill as well as submersible pumps are used for domestic, livestock and irrigation purposes;
- The pH values (Field parameters) measured during the survey ranged between 4.8 at VSTNF1 and 8.8 at GRMBH1 with an average of 6.9, indicating a wide range of acidic to alkaline groundwater present in the vicinity of the site; and
- EC values were mostly in the range of between ~800 – 1 100 µS/m which is common for aquifers in the Karoo sediments.

Table 10-1: Boreholes and Springs Identified during the Hydrocensus

Name	Latitude	Longitude	Status	Comment
BLYBH3	-25.78653	30.0396	Sampled	BH is installed with a pump.
BLYBH4	-25.78584	30.03391	Sampled	BH is used for drinking and dairy processing at the farm.

Name	Latitude	Longitude	Status	Comment
PARBH	-25.72007	30.01919	Sampled	Artesian well adjacent to the river. The BH is used for domestic purposes at the farm.
PARTP	-25.701666	30.015418	Sampled	Residents complain that the water does not taste well. They get their water supply from the nearby Universal Coal mine. Their wind mill has stopped functioning once the nearby mine started operating.
VSTNF1	-25.72526	30.00214	Sampled	BH at Alzu farm. The BH is inside a small pump house which had water overflowing, potentially due to leakages.
HADECBH	-25.7285	30.0095	Sampled	Water supply borehole for the villagers at Hadeco/Paardeplaats farm. The distance to the tap is approximately 150-200m.
HADECBH2	-25.74617	30.00243	Sampled	BH used for domestic purposes at the factory. The farm produces cut flowers for export.
HADECBH3	-25.746146	30.002385	Sampled	BH used for domestic purposes.
REBH1	-25.74287	30.00819	Sampled	Wind pump is broken and BH is not in use. The BH was previously used for water supply at the village.
ZOEBH	-25.78297	29.992	Sampled	BH is used for domestic, livestock and irrigation purposes as well as for milk production and processing.
BLVBH	-25.80862	30.00934	Sampled	BH is used for domestic, livestock and irrigation purposes.
DRIBH1	-25.77008	30.00168	Sampled	BH is used for domestic purposes at the farmhouse.
DRIBH2	-25.77664	30.00551	Not Sampled.	BH is capped and inaccessible.
SACBH	-25.78692	30.01089	Sampled	BH is used for domestic and irrigation purposes at the SA cherries farm.
BLY1	-25.81817	30.03196	Sampled	BH is used for domestic purposes at the farmhouse.
BLYBH2	-25.78216	30.03944	Sampled	BH use is not known.

Name	Latitude	Longitude	Status	Comment
VOGBH1	-25.78216	30.03944	Sampled	BH is used for both domestic and irrigation at the farm.
WELBH2	-25.75737	30.0429	Sampled	BH used for domestic purposes at the farmhouse. BH was capped and the water level could not be measured. According to the farm owner the water level is approximately 12 mbgl.
ZOEBH2	-25.75424	30.03874	Sampled	BH used for domestic purposes at the farm.
GRMBH1	-25.73594	30.0362	sampled	BH used for domestic purposes at the farm. BH depth is 200 m and the water level is approximately 11-12 mbgl.
WELCBH	-25.72482	30.04574	sampled	Community water supply with hand pump.
WELBH6	-25.76769	30.02648	Sampled	BH used for water supply at the farm/village for residents. BH has a hand pump installed.
Spring	-25.765435	29.999279	Not Sampled.	The spring is used for commercial bottled water.

Table 10-2: Field Parameters

Name	pH	Temperature ºC	EC mS/m	TDS mg/L
BLYBH4	7.15	19.5	1028	697
PARBH	8.2	20.2	90.8	62.4
PARTP	7.5	20.6	262	182
VSTNF1	4.8	21.2	544	389
HADECBH	7.2	22.3	223	152
HADECBH2	5.94	17.2	49.4	33.8
HADECBH3	6.2	19.8	96.4	69.5
REBH1	6.1	20.7	897	618
ZOEBH	7.19	16.4	1005	704
BLVBH	6.5	26.6	799	562
DRIBH1	7.14	26	836	594
SACBH	6.08	28.6	848	590
BLY1	6.8	20.8	818	558

Name	pH	Temperature ºC	EC mS/m	TDS mg/L
BLYBH2	6.67	21.5	828	618
VOGBH1	7.7	21.4	1104	767
WELBH2	6.94	23.7	916	637
ZOEBH2	6.8	26.7	871	588
GRMBH1	8.84	20.6	908	622
WELCBH	8.15	-	986	683
WELBH6	7.5	19.7	941	651

Table 10-3: Groundwater Levels Measured

Name	GW Level (mbgl)
BLYBH3	5.7
BLYBH4	17.38
HADECBH	28.55
REBH1	11.02
ZOEBH	5.48
BLVBH	3.14
DRIBH1	4.65
SACBH	4.93
BLYBH2	5.27
VOGBH1	2.86
ZOEBH2	11.13

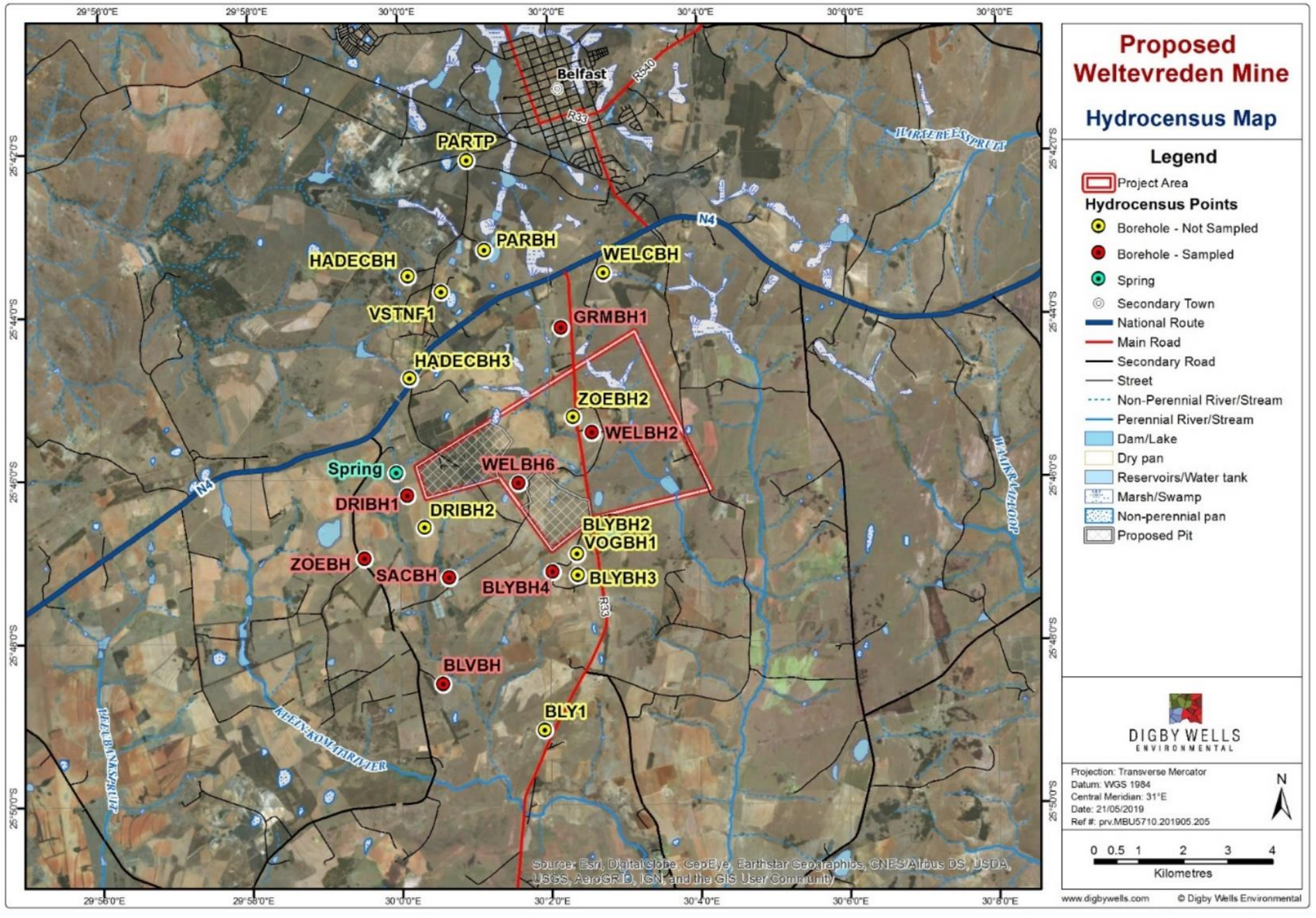


Figure 10-12: Hydrocensus Map

10.5.2 Groundwater Levels

Groundwater level measurements were taken at 11 boreholes - most of the other boreholes were equipped with a handpump or submersible pump. The groundwater level ranged between 2.9 mbgl at VOGBH1 and 28.6 mbgl at HADECBH1.

This indicates that in general groundwater levels are shallow, mostly less than ~10 mbgl near the site and mainly located within the shallow weathered aquifer. Deeper groundwater levels measured at HADECBH1 and BLYBH4 are most likely dynamic water levels due to active pumping from the boreholes.

The shallow groundwater levels at the site indicates there may be interaction between groundwater and surface water. Based on the shallow groundwater levels and taking into account the identified wetlands and surface water drainage (refer to Section 10.6 and 10.4, respectively), some of the wetlands, in particular the lower lying wetlands (i.e. floodplains, unchanneled bottom wetlands etc.) are likely to be (partially) groundwater related.

Groundwater levels were compared to surface elevations and a good correlation between surface elevation and groundwater level was found with a correlation coefficient of 0.97, indicating groundwater flow directions will mainly follow topography and the main surface water drainage directions (Figure 10-13). For the project site this indicates the main groundwater flow direction will be to the south towards the Nkomati River.

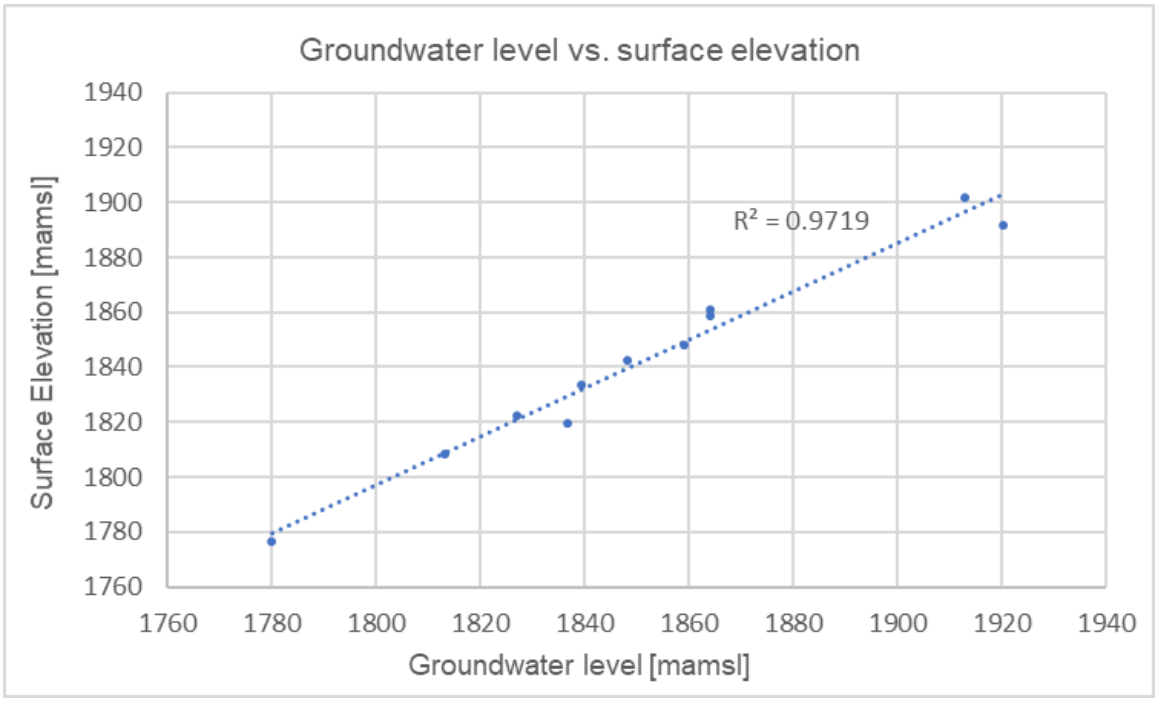


Figure 10-13: Bayesian Correlation between Surface Elevation and Groundwater Level

10.5.3 Groundwater Quality

The water quality results for the tested sites are shown in Table 10-4. The results form the baseline water quality data for the groundwater assessment within the study area. A total of nine samples (Refer to Table 10-1 and Figure 10-12 for the sampled locations) were sent for lab analysis. Based on the water quality results presented in Table 10-4, the following summary can be made for the baseline water quality:

- The groundwater in the area is predominantly of a Mg-HCO_3 type, with a few instances of Ca-HCO_3 and Na-SO_4, Na-Cl and Mg-Cl. This shows overall good groundwater quality and water which has been recently recharged to the shallow aquifer,
- However, water sampled from some boreholes indicate longer residence times allowing for ion exchange and for the groundwater to obtain a more Na-Cl characteristic, although the EC is still low and does not indicate saline water; and
- The nine groundwater samples taken showed the groundwater in the area to be of good quality, with no parameters exceeding any of the limits as per the SANS and WHO drinking water guidelines.

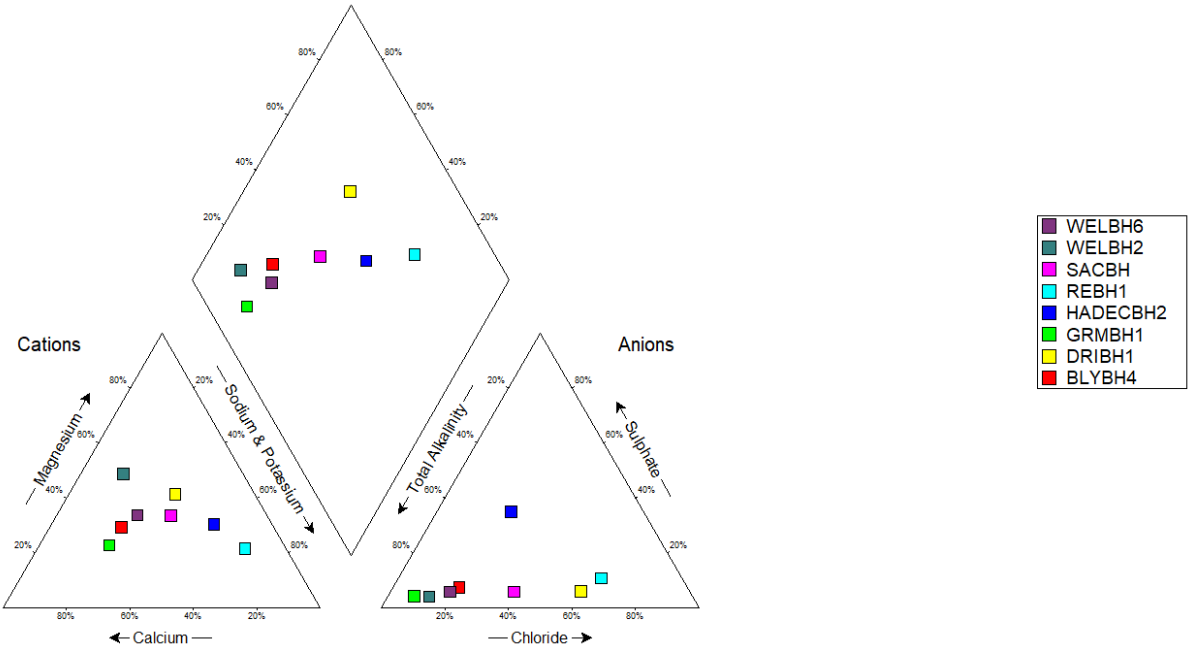


Figure 10-14: Piper Diagram

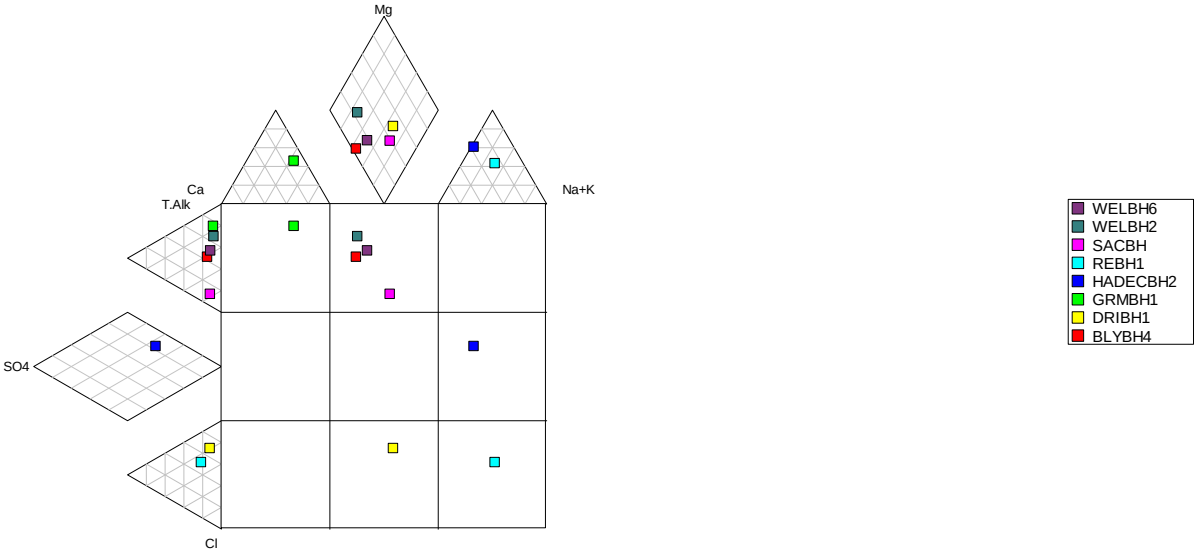


Figure 10-15: Expanded Durov Diagram

10.5.4 Environmental Sensitivity

The shallow groundwater levels at the site indicates it is likely there is some interaction between groundwater and surface water present at the site. This could mean streams and wetlands on-site may be groundwater fed or in contact with groundwater, and when mining commences and groundwater levels in the vicinity of the pit areas is lowered due to dewatering of the mine, this may impact upon the existing wetlands. However, this needs to be confirmed by the wetland and soil assessments to establish whether the identified wetlands are groundwater dependant and to classify soils and soil textures. This potential impact will be investigated further in the EIA phase of the project.

Table 10-4: Baseline Groundwater Quality Analysis

Parameter	SANS 241-1 2015 Drinking Water	WHO Drinking Water (2017)	BLVBH	BLYBH4	DRIBH1	GRMBH1	HADECBH2	SACBH	REBH1	WELBH2	WELBH6
Date			**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**
pH in water at 25ºC	5-9.7	NS	6.7	7.4	7.1	8.3	6.0	6.3	5.7	6.8	7.0
Total Alkalinity as CaCO3	1200	NS	44	72	12	44	<5	20	<5	44	28
Conductivity in mS/m	170	NS	11.8	20.6	9.5	10.4	3.7	11.3	5.3	11.7	7.4
Calcium	NS	NS	7.9	19.2	4.3	11.9	1.1	6.3	1.0	9.4	5.8
Magnesium	NS	NS	4.1	7.1	3.5	3.3	1.0	3.9	1.1	7.2	3.1
Sodium	200	200	5.9	9.1	5.2	4.6	1.5	6.7	4.0	3.5	2.9
Potassium	NS	NS	3.4	2.3	2.1	1.0	2.1	2.1	3.1	1.3	2.3
Iron	2	0.3	0.037	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
Phosphorus	NS	NS	0.072	0.086	0.069	0.080	0.070	0.064	0.071	0.064	0.070
Aluminium	0.3	0.1	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
Arsenic	0.01	0.01	< 0.010	< 0.010	< 0.010	0.033	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Boron	2.4	2.4	< 0.010	0.031	0.012	0.087	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Barium	0.7	0.7	0.04	0.10	0.19	0.01	0.11	0.10	0.15	0.04	0.03
Beryllium	NS	0.012	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cadmium	0.003	0.003	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cobalt	NS	NS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chromium	0.05	0.05	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Copper	2	2	0.051	< 0.010	< 0.010	0.014	0.033	< 0.010	< 0.010	0.0096	< 0.010
Manganese	0.4	0.4	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.026	< 0.025	< 0.025
Molybdenum	NS	NS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Parameter	SANS 241-1 2015 Drinking Water	WHO Drinking Water (2017)	BLVBH	BLYBH4	DRIBH1	GRMBH1	HADECBH2	SACBH	REBH1	WELBH2	WELBH6
Date			**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**	**02/05/19**
Nickel	0.07	0.07	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Lead	0.01	0.01	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Antimony	NS	NS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Selenium	0.04	0.04	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Tin	NS	NS	< 0.010	0.026	< 0.010	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Vanadium	NS	NS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Zinc	5	4	2.66	0.057	0.050	0.044	0.248	0.047	0.080	0.089	0.43
Chloride	300	250	4.0	15.0	15.0	3.0	2.0	10.0	9.0	5.0	5.0
Fluoride	1.5	1.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	<0.2	0.2
Nitrate as N	11	NS	0.2	1	2	0.2	1	4.9	1	0.3	0.1
Nitrite as N	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	500	250	2	7	2	<2	4	<2	<2	2	<2
Mercury	0.006	0.006	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Ammonia as N	1.5	35	0.2	0.1	0.1	0.1	0.2	0.2	0.1	<0.1	0.1

10.6 Soil and Land Capability

Due to the geomorphology of the area, the soil characteristics of the study area are complex. The land use and land capability reflect the differences in soil types.

Initial results from the desktop study indicate that the majority of the soils that occupy the valley bottom and lower slopes are of a colluvial or alluvial nature, producing relatively young soils with all of the features associated with immature pedogenisis, while the upper midslopes and crest slopes are typically areas of erosion and shallow exposure of the more mature and well developed soils, often associated with the more resistant lithologies.

This simplified catena is complicated further by the topographic aspect and attitude of the parent lithologies, with the north and west facing slopes characterised by much deeper and wetter soils while the southern and west facing slopes are much drier and generally return shallower rooting depths.

At a desktop level, it is not possible to predict or interpret all of these variables accurately, and field checking of these aspects and interpretation will be necessary in the final analysis.

However, from experience of soils mapped in close proximity to the site, some of the more common soils might/could include:

The Hutton, Clovelly, Griffin, Dresden, Glencoe, Oakleaf and Dundee, in association with the more obvious hydromorphic soils, including such forms as the Avalon, Westleigh, Bainsvlei, Longlands, Katspruit, Kroonstad, Sepane, Rensburg and Bonheim, and the much shallower Dresden, Glenrosa and Mispah forms.

These factors and the spatial distribution of the soils will be confirmed in the more detailed assessment. Indications are from past experience in the area, that the soils are somewhat variable in-depth profile, with changes in colour and consistency across the study area. The chemical composition is also likely to vary based on the host rock geochemistry.

10.7 Wetlands and Aquatic Ecology

The project area is located within the Southern Temperate Highveld freshwater ecoregion according to Darwall *et al.* (2009) and Scott (2015). This ecoregion is situated in the interior of South Africa, with the western boundary formed by the Magaliesberg, Pilanesberg and Waterberg mountain ranges, the northern boundary formed by the Soutpansberg, and the eastern boundary formed by the Drakensberg Mountains (Scott, 2015).

The dominant limnological features are rivers and seasonal pans. The main drainages are those of the westward-flowing Vaal River (the main tributary of the Orange River), and some stretches of the middle Caledon and Orange Rivers. The headwaters of the Crocodile, Marico, Sabie, Komati (or Incomati), Usutu, Pongola, and Tugela Rivers also drain from the highveld plateau to the east and northeast (Scott, 2015).

Although not necessarily within the present study area, approximately 127 freshwater fish species are known to inhabit the waters of the Southern Temperate Highveld freshwater

ecoregion, of which 23 are endemic (Darwall *et al.,* 2009). Four endemic species of the Odonata fauna occur within this ecoregion. These include: *Pseudagrion vaalense, P. citricola, Africallagma sapphirinum* and *Proischnura rotundipennis.* The species *Varicorhinus nelspruitensis* is endemic to the upper Komati and Pongola systems (Scott, 2015).

Although occurring at altitudes too low to be of direct relevance to the proposed Project area specifically, a number of species are reliant on the aquatic resources further downstream of the proposed Project area. *Kneria auriculata* is restricted to altitudes between 1,100 m and 1,400 m above sea level and five relict populations are known from tributaries to the Crocodile River (Scott, 2015), with which the Komati River confluences near the town of Komatipoort. *Amphilius natalensis* lives only in tributaries of the Komati and Olifants rivers, between 900 and 1,300 m and the rare Incomati rock catlet, *Chiloglanis bifurcus,* is endemic to the Komati River system and is found only between 900 and 1,200 m (Scott, 2015).

The area is also characterized by multiple pans, as well as a few river-associated wetlands. The wetlands are species-rich and contain few rare or endemic species. The dominant species within the eastern wetlands include *Carex acutiformis* and *Cyperus fastigiatus*. The wetland systems in the east remain fresh all year round, whereas the wetlands in the western part tend to become saline (Darwall *et al.,* 2009). Table 10-5 provides a summary of the relevant location-specific environmental attributes associated with the study area.

Table 10-5: Summary of Site Characteristics and Attributes of the Study Area

Political Region	Mpumalanga
Level 1 Ecoregion	11. Highveld
Level 2 Ecoregion	11.02
Freshwater Ecoregion	Southern Temperate Highveld
Geomorphic Province	Mpumalanga Highlands
Vegetation Type	Eastern Highveld Grassland Steenkampsberg Montane Grassland
Water Management Area	Inkomati
Secondary Catchment	X1
Quaternary Catchment	X11D
Watercourse	Komati River and adjoining tributaries
Slope Class	D – Upper foothills
Seasonality	Perennial

10.7.1 Regional Biodiversity Importance

10.7.1.1 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project represents a multi-partner project between the Council for Scientific and Industrial Research (CSIR), South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA; now Department of Water and Sanitation, or DWS), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). More specifically, the NFEPA project aims to:

- Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

The first aim uses systematic biodiversity planning to identify priorities for conserving South Africa's freshwater biodiversity within the context of equitable social and economic development. The second aim is comprised of two separate components: the (i) national component aimed to align DWS and DEA policy mechanisms and tools for managing and conserving freshwater ecosystems, while the (ii) sub-national component is aimed to use three case studies to demonstrate how NFEPA products should be implemented to influence land and water resource decision-making processes. The project further aimed to maximize synergies and alignment with other national level initiatives, including the National Biodiversity Assessment (NBA) and the Cross-Sector Policy Objectives for Inland Water Conservation (Driver *et al*., 2011).

Based on a desktop-based modelled wetland condition and a combination of special features, including expert knowledge (e.g. intact peat wetlands, presence of rare plants and animals, etc.) and available spatial data on the occurrence of threatened frogs and wetland-dependent birds, each of the wetlands within the inventory were ranked in terms of their biodiversity importance and as such, Wetland FEPA's were identified in an effort to achieve biodiversity targets (Driver *et al.,* 2011). Table 10-6 below indicates the criteria that were considered for the ranking of each of these wetland areas. Whilst being an invaluable tool, it is important to note that the NFEPA's were delineated and studied at a desktop and low resolution level. Thus, the wetlands delineated via the ground-truthing work done through this study may differ from the NFEPA layers. The NFEPA assessment does, however, hold significance from a national perspective.

Table 10-6: NFEPA Wetland Classification Ranking Criteria

NFEPA Wetland Criteria	NFEPA Rank
Wetlands that intersect with a RAMSAR site.	1
Wetlands within 500 m of an IUCN threatened frog point locality; Wetlands within 500 m of a threatened water bird point locality; Wetlands (excluding dams) with the majority of their area within a sub-quaternary catchment that has sightings or breeding areas for threatened Wattled Cranes, Grey Crowned Cranes and Blue Cranes; Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of exceptional Biodiversity importance, with valid reasons documented; and Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands that are good, intact examples from which to choose.	2
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of biodiversity importance, but with no valid reasons documented.	3
Wetlands (excluding dams) in A or B condition AND associated with more than three other wetlands (both riverine and non-riverine wetlands were assessed for this criterion); and Wetlands in C condition AND associated with more than three other wetlands (both riverine and non-riverine wetlands were assessed for this criterion).	4
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing Impacted Working for Wetland sites.	5
Any other wetland (excluding dams).	6

Based on the aforementioned criteria, the landscape comprises of bench depression and bench flat wetlands as well as hillslope seep wetlands. The identified wetlands were all Rank 6 wetlands. Figure 10-16 shows these NFEPA wetlands in relation to the project area.

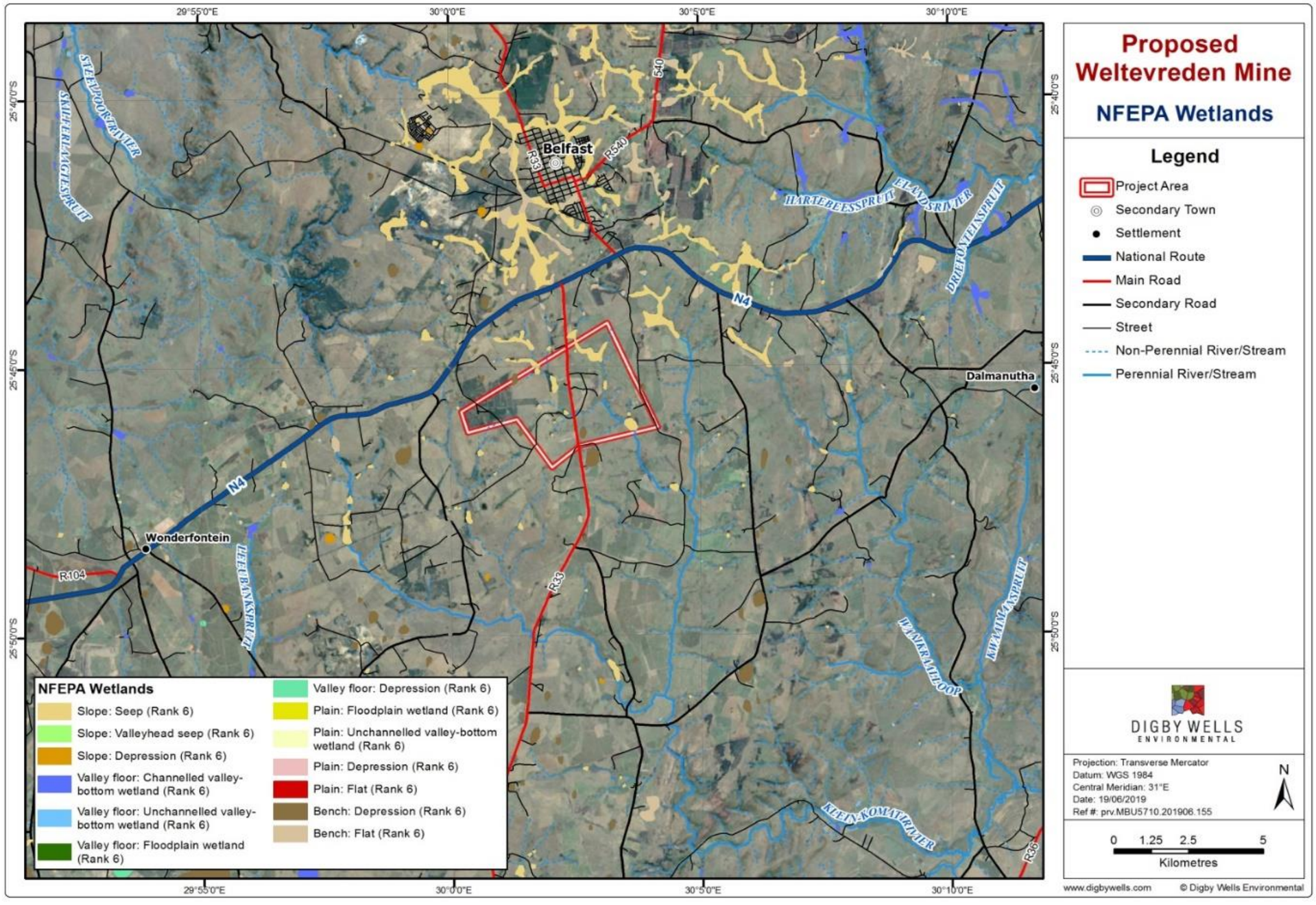


Figure 10-16: NFEPA Wetlands

10.7.1.2 Mpumalanga Biodiversity Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) is a spatial tool that forms part of the national biodiversity planning tools and initiatives that are provided for in national legislation and policy. The MBSP was published in 2014 by the Mpumalanga Tourism and Parks Agency (MTPA) and comprises a set of maps of biodiversity priority areas accompanied by contextual information and land-use guidelines for use in land-use and development planning, environmental assessment and regulation, and natural resource management. Strategically the MBSP enables the province to:

- Implement the NEMBA, 2004 provincially, and comply with requirements of the National Biodiversity Framework, 2009 (NBF) and certain international conventions;
- Identify those areas of highest biodiversity that need to be considered in provincial planning initiatives, and
- Address threat of climate change (ecosystem-based adaptation).

The publication includes terrestrial and freshwater biodiversity areas that are mapped and classified in Protected Areas (PAs), Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) or Other Natural Areas (ONAs). Wetlands in Mpumalanga Province have been extensively degraded and, in many cases, irreversibly modified and lost through a combination of inappropriate land-use practices, development and mining. Wetlands represent ecosystems of high value for delivering, managing and storing good quality water for human use, and they are vulnerable to harmful impacts. It is therefore in the interest of national water security that all wetlands are protected by law. The management objectives of these areas are summarised below (Table 10-7).

Table 10-7: Mpumalanga Biodiversity Sector Plan Categories

Map category	Definition	Desired management objectives
PA	Those areas that are proclaimed as protected areas under national or provincial legislation, including gazetted protected environments.	Areas that are meeting biodiversity targets and therefore must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
CBAs	Areas that are required to meet biodiversity targets, for species, ecosystems or ecological processes. CBA Wetlands are those that have been identified as FEPA wetlands that are important for meeting biodiversity targets for freshwater ecosystems.	Must be kept in a natural state, with no further loss of habitat. Only low-impact, biodiversity-sensitive land-uses are appropriate.

Map category	Definition	Desired management objectives
ESAs	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services. ESAs Wetlands are those that are non-FEPA and ESA Wetland Clusters are clusters of wetlands embedded within a largely natural landscape that function as a unit, and allow for the migration of species such as frogs and insects between individual wetlands.	Maintain in a functional, near-natural state, but some habitat loss is acceptable. A greater range of land-uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives are not compromised.
ONAs	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	An overall management objective should be to minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. These areas offer the greatest flexibility in terms of management objectives and permissible land-uses, but some authorisation may still be required for high-impact land-uses.
Heavily or Moderately Modified Areas	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructural functions, even if they are never prioritised for conservation action.	Such areas offer the most flexibility regarding potential land-uses, but these should be managed in a biodiversity-sensitive manner, aiming to maximise ecological functionality and authorisation is still required for high-impact land-uses. Moderately modified areas (old lands) should be stabilised and restored where possible, especially for soil carbon and water-related functionality.

Based on these primary outputs, the project area falls predominantly within the areas classified as ‘Moderately and Heavily Modified’, with the ‘Moderately Modified Areas’ described as old agricultural fields. A fair portion of the study area is classified as ‘Other Natural Areas’, while the north-eastern most corner is classified as CBA irreplaceable. Further to this, a large portion land to the east of the project area is regarded as CBA irreplaceable (Figure 10-17).

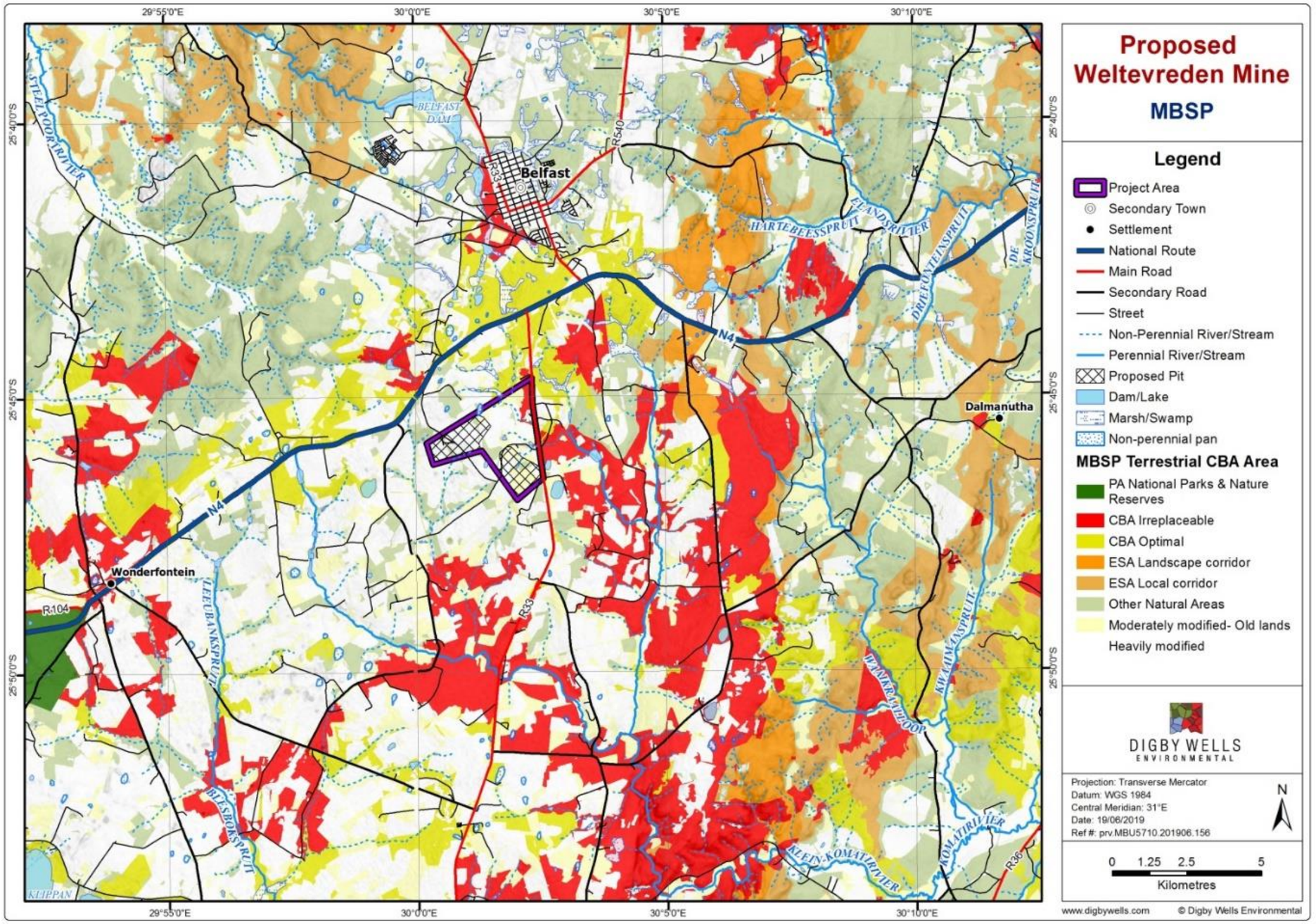


Figure 10-17: Mpumalanga Biodiversity Sector Plan

10.7.1.3 Mining and Biodiversity Guideline

The Mining and Biodiversity Guideline was developed collaboratively by SANBI, DEA and DMR and the Chamber of Mines and the South African Mining and Biodiversity Forum in 2013. The purpose of the guideline was to provide the mining sector with a manual to integrate biodiversity into the planning process thereby encouraging informed decision-making around mining development and environmental authorisations. The aim of the guideline is to explain the value for mining companies to consider biodiversity management throughout the planning process. The guideline highlights the importance of biodiversity in managing the social, economic and environmental risks of the proposed mining project. The country has been mapped into biodiversity priority areas including the four categories listed in Table 10-8 below, each with associated risks and implications (DEA *et al.,* 2013).

Table 10-8: Mining and Biodiversity Guidelines Categories (Department of Environmental Affairs *et al.* 2013)

Category	Risk and Implications for Mining
Legally protected	Mining prohibited; unless authorised by ministers of both the DEA and DMR.
Highest Biodiversity Importance	Highest Risk for Mining: the EIA process must confirm significance of the biodiversity features that may be seen as a fatal flaw to the proposed project. Specialists must provide site-specific recommendations for the application of the mitigation hierarchy that informs the decision making processes of mining licences, water use licences and environmental authorisations. If granted, authorisations should set limits on allowed activities and specify biodiversity related management outcomes.
High Biodiversity Importance	High Risk for Mining: the EIA process must confirm the significance of the biodiversity features for the conservation of biodiversity priority areas. Significance of impacts must be discussed as mining options are possible but must be limited. Authorisations may set limits and specify biodiversity related management outcomes.
Moderate Biodiversity Importance	Moderate Risk for Mining: the EIA process must confirm the significance of the biodiversity features and the potential impacts as mining options must be limited but are possible. Authorisations may set limits and specify biodiversity related management outcomes.

The proposed Project area is dominated by areas classified as ‘Highest Biodiversity Importance - Highest Risk for Mining’, with only a small portion in the vicinity of the proposed OC1 pit classified as ‘Moderate Biodiversity Importance - Moderate Risk for Mining’ (Figure 10-18).

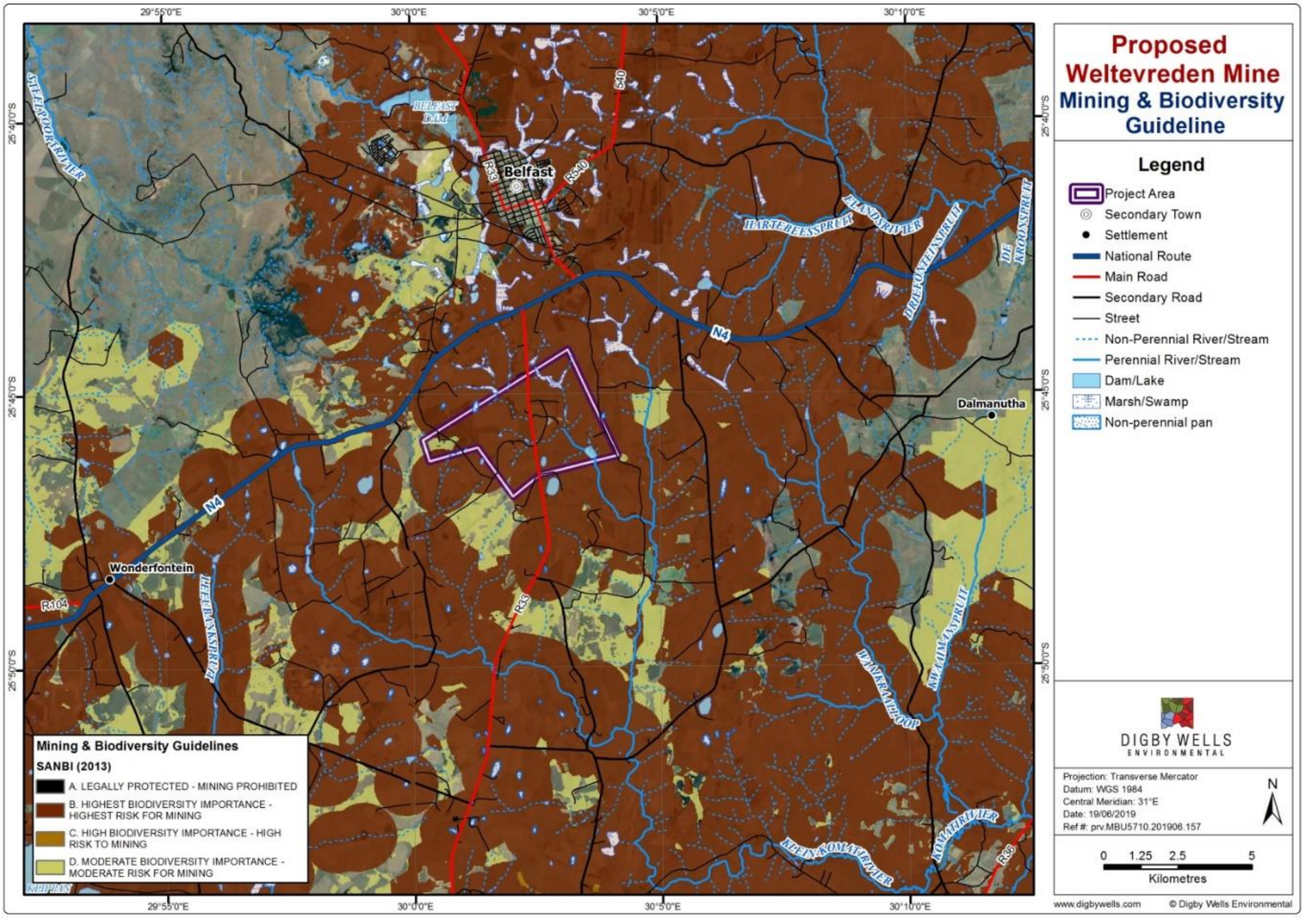


Figure 10-18: Mining and Biodiversity Guideline

10.8 Flora

10.8.1 Regional vegetation

According to Mucina and Rutherford (2012), the proposed operation is located in an area classified as Eastern Highveld Grassland (Gm 12) (Figure 10-19).

10.8.1.1 Eastern Highveld Grassland (Mapping Unit Gm12)

The Eastern Highveld Grassland is distributed within the Mpumalanga and Gauteng Provinces of South Africa on the plains between Belfast in the east and the eastern side of Johannesburg in the west, extending southwards to Bethal, Ermelo, and west of Piet Retief (Mucina & Rutherford; 2006). The altitude varies between 1 520 and 1 780 m, but also as low as 1 300 m.

The Eastern Highveld Grassland occurs in high rainfall areas on leached soils. The soils of this Eastern Highveld Grassland consist of yellow sandy soils of the Ba (30%) and Bb (65%) land types found on shale and sandstone of the Karoo Supergroup. It generally occurs on slightly to moderately undulating plains, including some low hills and pan depressions and consist of short, dense grassland, dominated by the usual Highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya,* to name a few.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (Mucina & Rutherford; 2006). Woody species include *Senegalia caffra, Celtis africana, Diospyros lycioides subsp. lycioides, Parinari capensis, Protea caffra,* and *Rhus magalismontana*.

The Eastern Highveld grassland is classified as an endangered vegetation type (Rouget *et al*., 2004; Mucina & Rutherford, 2012, Ferrar & Lötter, 2007) due to mining activities within the provinces, with a conservation target of 24% (NSBAR, 2004). Approximately 44% of the Eastern Highveld Grassland has been transformed, primarily by cultivation, plantations, mining, urbanization, and building of dams (Mucina & Rutherford; 2006). The conservation status of this vegetation type is very poor and is now largely ploughed, with natural vegetation restricted to patchy remnants, which are often heavily grazed. Cultivation may have had a more extensive impact, indicated by land-cover data. Only a very small fraction is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). No serious alien invasions are reported, but *Acacia mearnsii,* or Black Wattle can become dominant in disturbed areas. Erosion is very low (Mucina & Rutherford, 2006).

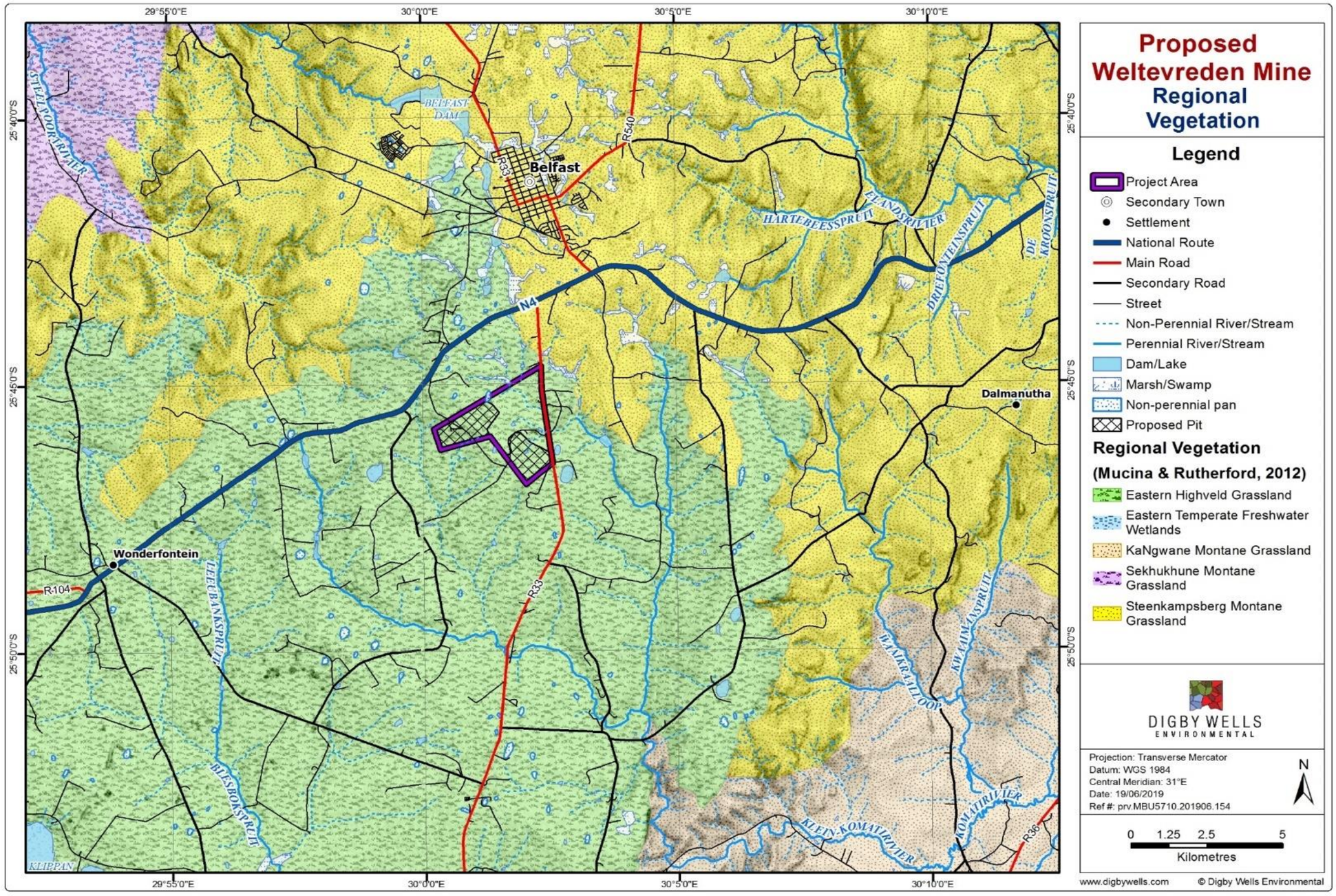


Figure 10-19: Regional Vegetation Types

10.8.2 Species of Conservation Concern (SCC)

The assessment of plants of conservation concern is based on the following legislation and international sources:

- International Union for Conservation of Nature (IUCN);
- National Forest Act, 1998 (Act No. 84 of 1998) (NFA);
- Mpumalanga Nature Conservation Act, 1998 (Act No.10 of 1998) (MPNCA).

10.8.2.1 International Union for Conservation of Nature (IUCN)

10.8.2.1.1 SANBI's Threatened Species Programme

SANBI's Threatened Species Programme (TSP) was started with the primary role of fulfilling the South African National Biodiversity Institute (SANBI) mandate to monitor and report on the conservation status of South Africa's indigenous plant and animal species. This program coordinates the collection of data on species, particularly those that are not well documented, and this data is used to assess species' status according to the internationally accredited Red List Categories and Criteria developed by the International Union for Conservation of Nature (IUCN). In addition, the TSP co-ordinates and promotes the application of species data in all spheres of biodiversity conservation- from national and international conservation legislation and policy to conservation planning. A list of possible flora species of special concern that has the potential to occur in the project area and their Red List status is provided in Table 10-9.

Table 10-9: List of Potential Flora Species in the Project Area,

Family	Species	Conservation Status
Iridaceae	*Gladiolus malvinus*	**Vulnerable**
Aizoaceae	*Khadia carolinensis*	**Vulnerable**
Rosaceae	*Prunus africana*	**Vulnerable**
Apocynaceae	*Miraglossum davyi*	**Vulnerable**
Araceae	*Zantedeschia pentlandii*	**Vulnerable**
Asphodelaceae	*Aloe reitzii var. reitzii*	**Near Threatened**
Amaryllidaceae	*Boophone disticha*	Declining
Asteraceae	*Callilepis leptophylla*	Declining
Amaryllidaceae	*Crinum bulbispermum*	Declining

Family	Species	Conservation Status
Hyacinthaceae	*Eucomis montana*	Declining
Gunneraceae	*Gunnera perpensa*	Declining
Asteraceae	*Helichrysum homilochrysum*	Rare
Hypoxidaceae	*Hypoxis hemerocallidea*	Declining
Aizoaceae	*Khadia alticola*	Rare
Aquifoliaceae	*Ilex mitis*	Declining
Proteaceae	*Protea parvula*	**Near Threatened**
Apocynaceae	*Riocreuxia aberrans*	**Near Threatened**

Figure 10-20: Species with the Potential to Occur on Site (Google Images, 2019)

A) Protea parvula, B) Khadia alticola, C) Zantedeschia pentlandii, D) Miraglossum davyi, E) Aloe reitzii var. reitzii, F) Hypoxis hemerocallidae, G) Gunnera perpensa, H) Eucomis montana, I) Khadia carolinensis

10.8.2.2 National Forest Act (Act No. 84 of 1998) (NFA)

The Minister may declare a particular tree; a particular group of trees; a particular woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species Protected trees in South Africa and are regulated and in terms of section 15(1) of the National Forests Act, 1998 (Act No. 84 of 1998). In this Act, the definition of a 'tree 'is any tree seedling, sapling, transplant or coppice shoot of any age and any root, branch or other part of it. The Minister of Agriculture, Forestry and Fisheries has published a list of all protected trees belonging to different species under section 12(1)(d) of the NFA, as set out in the schedule to this notice. The effect of this declaration is that in terms of section 15 (1) "No person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister and relevant authorities". Based on a search of historical records within the quarter degree squares (QDS) 2530CC and 2530CA QDS no protected trees are known to occur in the project area.

10.8.2.3 Mpumalanga Nature Conservation Act (MPNCA), (Act No. 10 of 1998)

The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) is the custodian for the sustainable use of resources and environmental protection in the Mpumalanga Province. This department is responsible for the implementation of the MPNCA. The MPNCA is a provincial law providing for the protection of species and important conservation areas (protected areas). This act includes regulations which call for the protection of indigenous plants and animals which require a permit from the provincial authority for its picking, selling, removal, donation, and/or export in the province. Specifically, schedule 11 (Protected plant species) and Schedule 12 (Specially Protected plant species) have relevance to this section of the scoping report. Table 10-10 provides a list of protected plant species that could potentially occur on site based on historical records for the immediate region of the project area. A total of seven species protected under Schedule 11 may potentially be recorded in the project area.

Table 10-10: Protected Plant Species under the Mpumalanga Nature-Conservation Act (MPNCA) that could potentially occur on site

Family	Scientific Name	Status
Hyacinthaceae	*Eucomis montana*	MPNCA, Schedule 11
Iridaceae	*Gladiolus malvinus*	MPNCA, Schedule 11
Amaryllidaceae	*Crinum bulbispermum*	MPNCA, Schedule 11
Hyacinthaceae	*Eucomis montana*	MPNCA, Schedule 11
Asphodelaceae	*Aloe reitzii var. reitzii*	MPNCA, Schedule 11
Proteaceae	*Protea parvula*	MPNCA, Schedule 11
Amaryllidaceae	*Boophone disticha*	MPNCA, Schedule 11

10.8.3 Alien and Exotic Vegetation

The Convention on Biological Diversity (2002) defines alien species as plants and animals introduced outside of their "natural past or present distribution, whose introduction and/or spread threatens the biodiversity of the areas they invade". Alien Plant invasion has negative impacts on the structure and functionality of ecosystems.

Alien Invasive Plant species (AIPs) have been classified according to Alien Invasive Species List (GN R864 in GG 40166 of 29 July 2016) of the NEM: BA (Act 10 of 2004). Each of the categories listed in this act has different legal obligations and conditions as indicated below:

- Category 1a: Species requiring compulsory control. Any individuals that fall into this category must be removed by law and no permits are issued;
- Category 1b: Invasive species controlled by an Alien Invasive Species Management Programme. These species must be removed and destroyed;
- Category 2: Invasive species controlled by area, and;
- Category 3: Invasive species controlled by activity.

Table 10-11 provides a list of the 10 NEM: BA listed and weed species that could potentially be present on site based on historical records for the quarter degree squares (QDS) 2630CA and 2630CB.

Table 10-11: Alien Invasive Plant Species Potentially Occurring on Site

Family	Species	Common Name	NEMBA Invasive category
Amaranthaceae	*Amaranthus hibridus*	Pigweed	Weed
	Gomprena celosiodes	Bachelor's Button	Weed
Asteraceae	*Bidens pilosa*	Common Black-jack	Weed
	Cirsium vulgare	Scotch Thistle	1b
	Conyza bonariensis	Hairy Fleabane	Weed
	Tagetes minuta	Tall Khakhi Weed	Weed
Fabaceae	*Acacia mearnsii*	Black Wattle	2
	Glycine max	Soy Bean	Crop
Myrtaceae	*Eucalyptus camaldulensis*	Red River Gum	2
Papaveraceae	*Argemone mexicana*	Mexican Poppy	1b
Pinaceae	*Pinus patula*	Patula Pine	2
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	1b in Protected areas and wetlands

Family	Species	Common Name	NEMBA Invasive category
			in which it does not exist
	Stenotaphrum secundatum	Buffalo-turf Grass	Weed
	Zea mays	Maize	Crop
Solanaceae	*Datura stramonium*	Common Thorn Apple	1b
	Nicandra physalodes	Apple of Peru	1b
	Solanum mauritianum	Bugweed	1b
Verbenaceae	*Verbena bonariensis*	Tall Verbena	1b
	Verbena officinalis	Common Vervain	Weed

10.9 Fauna

10.9.1 Mammals

The following mammals may occur in the project area based on the search results on the Animal Demography Unit (ADU) database, a total of 33 mammal species are listed for the project area (Table 10-12), eight of which are listed as Red Data species.

Table 10-12: Mammal Species Potentially Occurring on Site

Family	Scientific Name	Common Name	Conservation Status
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern (2016)
Bathyergidae	*Georychus capensis*	Cape Mole-rat	Least Concern (2016)
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	Least Concern (2008)
Bovidae	*Connochaetes gnou*	Black Wildebeest	Least Concern (2016)
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (2016)
Bovidae	*Ourebia ourebi*	Oribi	**Endangered**
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (2016)
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)

Family	Scientific Name	Common Name	Conservation Status
Canidae	*Canis adustus*	Side-striped Jackal	Least Concern (2016)
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)
Canidae	*Vulpes chama*	Cape Fox	Least Concern (2016)
Chrysochloridae	*Amblysomus robustus*	Robust Golden Mole	**Vulnerable (2016)**
Chrysochloridae	*Chrysospalax villosus*	Rough-haired Golden Mole	**Vulnerable (2016)**
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	**Near Threatened (2016)**
Felidae	*Leptailurus serval*	Serval	**Near Threatened (2016)**
Felidae	*Panthera pardus*	Leopard	**Vulnerable (2016)**
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (2016)
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern (2016)
Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	Least Concern (2016)
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)
Muridae	*Mus (Nannomys) minutoides*	Southern African Pygmy Mouse	Least Concern
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern (2016)
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (2016)
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern (2016)
Rhinolophidae	*Rhinolophus blasii*	Blasius's Horseshoe Bat	**Near Threatened (2016)**

Family	Scientific Name	Common Name	Conservation Status
Rhinolophidae	*Rhinolophus simulator*	Bushveld Horseshoe Bat	Least Concern (2016)
Rhinolophidae	*Rhinolophus swinnyi*	Swinny's Horseshoe Bat	**Vulnerable (2016)**
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	**Near Threatened (2016)**
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern (2016)
Suidae	*Potamochoerus larvatus koiropotamus*	Bush-pig (subspecies koiropotamus)	Least Concern (2016)
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (2016)
Viverridae	*Civettictis civetta*	African Civet	Least Concern (2016)

10.9.2 Herpetofauna

Based on the results of the ADU database search the following amphibians may occur in the project area (Table 10-13), a total of 16 frog species; and 59 reptile species. None of these species are listed as Red Data species.

Table 10-13: Herpetofauna Potentially Occurring on Site

Family	Scientific Name	Common Name	Conservation Status
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern
Brevicepitidae	*Breviceps mossambicus*	Mozambique Rain Frog	Least Concern
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern
Bufonidae	*Vandijkophrynus gariepensis gariepensis*	Karoo Toad (subsp. gariepensis)	Not Listed
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern
Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)
Pyxicephalidae	*Cacosternum sp.*		Not Listed

Family	Scientific Name	Common Name	Conservation Status
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)
Pyxicephalidae	*Cacosternum nanum*	Bronze Caco	Least Concern (2013)
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern
Chamaeleonidae	*Bradypodion transvaalense*	Wolkberg Dwarf Chameleon	Least Concern (SARCA 2014)
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)
Colubridae	*Philothamnus hoplogaster*	South Eastern Green Snake	Least Concern (SARCA 2014)
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	Least Concern (SARCA 2014)
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)
Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern (SARCA 2014)
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus capensis capensis*	Common Dwarf Gecko	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern (SARCA 2014)
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern (SARCA 2014)
Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern (SARCA 2014)
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern (SARCA 2014)
Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern (SARCA 2014)

Family	Scientific Name	Common Name	Conservation Status
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern (SARCA 2014)
Scincidae	*Scelotes mirus*	Montane Dwarf Burrowing Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (SARCA 2014)
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern (SARCA 2014)
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern (SARCA 2014)
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)
Colubridae	*Philothamnus occidentalis*	Western Natal Green Snake	Least Concern (SARCA 2014)
Cordylidae	*Chamaesaura aenea*	Coppery Grass Lizard	Near Threatened (SARCA 2014)
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)
Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern (SARCA 2014)
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)
Elapidae	*Naja annulifera*	Snouted Cobra	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern (SARCA 2014)

Family	Scientific Name	Common Name	Conservation Status
Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern (SARCA 2014)
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
Lacertidae	*Pedioplanis lineoocellata lineoocellata*	Spotted Sand Lizard	Least Concern (SARCA 2014)
Lamprophiidae	*Amplorhinus multimaculatus*	Many-spotted Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern (SARCA 2014)
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern (SARCA 2014)
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Inyoka swazicus*	Swazi Rock Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycodonomorphus inornatus*	Olive House Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern (SARCA 2014)
Leptotyphlopidae	*Leptotyphlops incognitus*	Incognito Thread Snake	Least Concern (SARCA 2014)
Scincidae	*Acontias breviceps*	Short-headed Legless Skink	Least Concern (SARCA 2014)
Scincidae	*Acontias plumbeus*	Giant Legless Skink	Least Concern (SARCA 2014)

Family	Scientific Name	Common Name	Conservation Status
Scincidae	*Panaspis wahlbergi*	Wahlberg's Snake-eyed Skink	Least Concern (SARCA 2014)
Scincidae	*Scelotes mirus*	Montane Dwarf Burrowing Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops schlegelii*	Schlegel's Beaked Blind Snake	Least Concern (SARCA 2014)
Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern (SARCA 2014)
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern (SARCA 2014)

10.9.3 Birds (Avifauna)

Recently acquired data (according to SABAP2) of the project area corresponding to the quarter degree squares (QDS) 2630CA and 2630CC as well as old records from SABAP1 indicate that approximately 261 bird species are expected to occur in the study area. This includes a number of Red Data species and species that are endemic to southern Africa (Table 10-14).

Table 10-14: Red Data and Endemic Avifauna Species Potentially Occurring on Site

Common Name	Scientific Name	SA Red Data Status	Endemism Status
Black Stork	***Ciconia nigra***	**Near Threatened**	**-**
Southern Bald Ibis	***Geronticus calvus***	**Vulnerable**	**-**
Greater Flamingo	***Phoenicopterus roseus***	**Near Threatened**	**-**
Maccoa Duck	*Oxyura maccoa*	Least Concern	-
Secretarybird	***Sagittarius serpentarius***	**Near Threatened**	**-**
Cape Vulture	***Gyps coprotheres***	**Vulnerable**	**-**
African Marsh-Harrier	***Circus ranivorus***	**Vulnerable**	**-**
Lanner Falcon	*Falco biarmicus*	Least Concern	-
Red-footed Falcon	*Falco vespertinus*	Least Concern	-

Common Name	Scientific Name	SA Red Data Status	Endemism Status
Lesser Kestrel	***Falco naumanni***	**Vulnerable**	**-**
Wattled Crane	***Bugeranus carunculatus***	**Critically Endangered**	**-**
Blue Crane	***Anthropoides paradiseus***	**Vulnerable**	**-**
Grey Crowned Crane	***Balearica regulorum***	**Endangered**	**-**
Denham's Bustard	***Neotis denhami***	**Vulnerable**	**-**
White-bellied Korhaan	***Eupodotis senegalensis***	**Vulnerable**	**-**
Blue Korhaan	***Eupodotis caerulescens***	**Near Threatened**	**-**
Black-bellied Bustard	***Lissotis melanogaster***	**Near Threatened**	**-**
Black-winged Lapwing	*Vanellus melanopterus*	Least Concern	-
Black-winged Pratincole	***Glareola nordmanni***	**Near Threatened**	**-**
African Grass-Owl	***Tyto capensis***	**Vulnerable**	**-**
Giant Kingfisher	*Megaceryle maxima*	Least Concern	-
Rudd's Lark	***Heteromirafra ruddi***	**Critically Endangered**	**-**
Yellow-breasted Pipit	***Anthus chloris***	**Vulnerable**	**-**
Southern Bald Ibis	***Geronticus calvus***	**Vulnerable**	**Endemic**
South African Shelduck	*Tadorna cana*	-	Endemic
Cape Shoveler	*Anas smithii*	-	Endemic
Cape Vulture	***Gyps coprotheres***	**Vulnerable**	**Endemic**
Jackal Buzzard	*Buteo rufofuscus*	-	Endemic
Grey-winged francolin	*Scleroptila africana*	-	Endemic
Blue Crane	***Anthropoides paradiseus***	**Vulnerable**	**Endemic**
Blue Korhaan	***Eupodotis caerulescens***	**Near Threatened**	**Endemic**
Acacia Pied Barbet	*Tricholaema leucomelas*	-	Near Endemic
Eastern Clapper Lark	*Mirafra fasciolata*	-	Near Endemic
Rudd's Lark	***Heteromirafra ruddi***	**Critically Endangered**	**Endemic**
Eastern Long-billed Lark	*Certhilauda semitorquata*	-	Endemic

Common Name	Scientific Name	SA Red Data Status	Endemism Status
South African Cliff-Swallow	*Petrochelidon spilodera*	-	Breeding Endemic
Karoo Thrush	*Turdus smithi*	-	Endemic
Mountain Wheatear	*Oenanthe monticola*	-	Near-Endemic
Ant-eating Chat	*Myrmecocichla formicivora*	-	Endemic
Cape Grassbird	*Sphenoeacus afer*	-	Endemic
Cloud Cisticola	*Cisticola textrix*	-	Near Endemic
Drakensberg Prinia	*Prinia hypoxantha*	-	Endemic
Fiscal Flycatcher	*Sigelus silens*	-	Endemic
Cape Batis	*Batis capensis*	-	Endemic
Yellow-breasted Pipit	***Anthus chloris***	**Vulnerable**	**Endemic**
Cape Longclaw	*Macronyx capensis*	-	Endemic
Southern Boubou	*Laniarius ferrugineus*	-	Endemic
Bokmakierie	*Telophorus zeylonus*	-	Near Endemic
Olive Bush-Shrike	*Chlorophoneus olivaceus*	-	Near-Endemic
Pied Starling	*Lamprotornis bicolor*	-	Endemic
Cape White-eye	*Zosterops capensis*	-	Endemic
Cape Sparrow	*Passer melanurus*	-	Near Endemic
Cape Weaver	*Ploceus capensis*	-	Endemic
Red-headed Finch	*Amadina erythrocephala*	-	Near Endemic
Cape Canary	*Serinus canicollis*	-	Endemic
Cape Bunting	*Emberiza capensis*	-	Near Endemic

10.9.4 Invertebrates

Over a 130 invertebrate species may potentially occur in the project area based on the results of the ADU database search for species previously recorded in the vicinity of the project area. However, any species which is not listed with a corresponding conservation status is not included in the list herein. This will be appended to the Fauna and Flora Impact Assessment Report which will be released for public comment with the Draft EIA. The species with a conservation status listing are provided in Table 10-15 below.

Table 10-15: Invertebrate Species Potentially Occur on Site

Family	Scientific Name	Common Name	Conservation Status
Aeshnidae	*Anax imperator*	Blue Emperor	Least Concern
Aeshnidae	*Anax speratus*	(Eastern) Orange Emperor	Least Concern
Aeshnidae	*Pinheyschna subpupillata*	Stream Hawker	Least Concern
Aeshnidae	*Zosteraeschna minuscula*	Friendly Hawker	Least Concern
Chlorocyphidae	*Platycypha caligata*	Dancing Jewel	Least Concern
Chlorocyphidae	*Platycypha fitzsimonsi*	Boulder Jewel	Least Concern
Coenagrionidae	*Africallagma fractum*	Slender Bluet	Least Concern
Coenagrionidae	*Africallagma glaucum*	Swamp Bluet	Least Concern
Coenagrionidae	*Africallagma sapphirinum*	Sapphire Bluet	Least Concern
Coenagrionidae	*Azuragrion nigridorsum*	Sailing Bluet	Least Concern
Coenagrionidae	*Ischnura senegalensis*	Tropical Bluetail	Least Concern
Coenagrionidae	*Pseudagrion citricola*	Yellow-faced Sprite	Least Concern
Coenagrionidae	*Pseudagrion kersteni*	Powder-faced Sprite	Least Concern
Coenagrionidae	*Pseudagrion salisburyense*	Slate Sprite	Least Concern
Coenagrionidae	*Pseudagrion spernatum*	Upland Sprite	Least Concern
Gomphidae	*Ceratogomphus pictus*	Common Thorntail	Least Concern
Gomphidae	*Paragomphus cognatus*	Rock Hooktail	Least Concern

Family	Scientific Name	Common Name	Conservation Status
Lestidae	*Lestes virgatus*	Smoky Spreadwing	Least Concern
Libellulidae	*Crocothemis erythraea*	Broad Scarlet	Least Concern
Libellulidae	*Crocothemis sanguinolenta*	Little Scarlet	Least Concern
Libellulidae	*Diplacodes lefebvrii*	Black Percher	Least Concern
Libellulidae	*Diplacodes pumila*	Dwarf Percher	Least Concern (Global); EN (RSA)
Libellulidae	*Nesciothemis farinosa*	Eastern Blacktail	Least Concern
Libellulidae	*Orthetrum caffrum*	Two-striped Skimmer	Least Concern
Libellulidae	*Orthetrum julia*	Julia Skimmer	Least Concern
Libellulidae	*Palpopleura jucunda*	Yellow-veined Widow	Least Concern
Libellulidae	*Pantala flavescens*	Wandering Glider	Least Concern
Libellulidae	*Sympetrum fonscolombii*	Red-veined Darter or Nomad	Least Concern
Libellulidae	*Trithemis arteriosa*	Red-veined Dropwing	Least Concern
Libellulidae	*Trithemis dorsalis*	Highland Dropwing	Least Concern
Libellulidae	*Trithemis furva*	Navy Dropwing	Least Concern
Libellulidae	*Trithemis stictica*	Jaunty Dropwing	Least Concern
Platycnemididae	*Elattoneura glauca*	Common Threadtail	Least Concern
Synlestidae	*Chlorolestes fasciatus*	Mountain Malachite	Least Concern
Geometridae	*Zerenopsis lepida*	Leopard magpie moth	Not Threatened (NT) [not an IUCN category]
Hesperiidae	*Coeliades forestan forestan*	Striped policeman	Least Concern (SABCA 2013)

Family	Scientific Name	Common Name	Conservation Status
Hesperiidae	*Kedestes barberae barberae*	Barber's ranger	Least Concern (SABCA 2013)
Hesperiidae	*Kedestes mohozutza*	Fulvous ranger	Least Concern (SABCA 2013)
Hesperiidae	*Spialia mafa mafa*	Mafa sandman	Least Concern (SABCA 2013)
Hesperiidae	*Spialia spio*	Mountain sandman	Least Concern (SABCA 2013)
Lycaenidae	*Actizera lucida*	Rayed blue	Least Concern (SABCA 2013)
Lycaenidae	*Azanus moriqua*	Black-bordered babul blue	Least Concern (SABCA 2013)
Lycaenidae	*Cacyreus fracta fracta*	Water geranium bronze	Least Concern (SABCA 2013)
Lycaenidae	*Cacyreus virilis*	Mocker bronze	Least Concern (SABCA 2013)
Lycaenidae	*Chrysoritis aethon*	Lydenburg opal	Least Concern (SABCA 2013)
Lycaenidae	*Lampides boeticus*	Pea blue	Least Concern (SABCA 2013)
Lycaenidae	*Lycaena clarki*	Eastern sorrel copper	Least Concern (SABCA 2013)
Lycaenidae	*Zizeeria knysna knysna*	African grass blue	Least Concern (SABCA 2013)
Nymphalidae	*Aeropetes tulbaghia*	Table mountain beauty	Least Concern (SABCA 2013)
Nymphalidae	*Byblia ilithyia*	Spotted joker	Least Concern (SABCA 2013)
Nymphalidae	*Charaxes achaemenes achaemenes*	Bushveld charaxes	Least Concern (SABCA 2013)
Nymphalidae	*Charaxes ethalion ethalion*	Coast charaxes	Least Concern (SABCA 2013)
Nymphalidae	*Charaxes vansoni*	Van Son's charaxes	Least Concern (SABCA 2013)
Nymphalidae	*Danaus chrysippus orientis*	African monarch, Plain tiger	Least Concern (SABCA 2013)
Nymphalidae	*Dingana alticola*	Alpine widow	Least Concern (SABCA 2013)

Family	Scientific Name	Common Name	Conservation Status
Nymphalidae	*Hypolimnas misippus*	Common diadem	Least Concern (SABCA 2013)
Nymphalidae	*Junonia orithya madagascariensis*	Eyed pansy	Least Concern (SABCA 2013)
Nymphalidae	*Paternympha narycia*	Spotted-eye brown	Least Concern (SABCA 2013)
Nymphalidae	*Phalanta phalantha aethiopica*	African leopard	Least Concern (SABCA 2013)
Nymphalidae	*Precis archesia archesia*	Garden commodore	Least Concern (SABCA 2013)
Nymphalidae	*Precis ceryne ceryne*	Marsh commodore	Least Concern (SABCA 2013)
Nymphalidae	*Precis octavia sesamus*	Gaudy Commodore	Least Concern (SABCA 2013)
Nymphalidae	*Pseudonympha magoides*	False silver-bottom brown	Least Concern (SABCA 2013)
Nymphalidae	*Pseudonympha varii*	Vari's brown	Least Concern (SABCA 2013)
Nymphalidae	*Stygionympha curlei*	Curle's hillside brown	Least Concern (SABCA 2013)
Nymphalidae	*Stygionympha wichgrafi wichgrafi*	Wichgraf's hillside brown	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia anacreon*	Orange acraea	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia rahira rahira*	Marsh acraea	Least Concern (SABCA 2013)
Papilionidae	*Papilio dardanus cenea*	Mocker swallowtail, Flying Handkerchief	Least Concern (SABCA 2013)
Papilionidae	*Papilio demodocus demodocus*	Citrus swallowtail	Least Concern (SABCA 2013)
Pieridae	*Belenois aurota*	Brown-veined white	Least Concern (SABCA 2013)
Pieridae	*Belenois creona severina*	African common white	Least Concern (SABCA 2013)
Pieridae	*Belenois zochalia zochalia*	Forest white	Least Concern (SABCA 2013)
Pieridae	*Catopsilia florella*	African migrant	Least Concern (SABCA 2013)

Family	Scientific Name	Common Name	Conservation Status
Pieridae	*Colias electo electo*	African clouded yellow	Least Concern (SABCA 2013)
Pieridae	*Colotis ione*	Bushveld purple tip	Least Concern (SABCA 2013)
Pieridae	*Eronia cleodora*	Vine-leaf vagrant	Least Concern (SABCA 2013)
Pieridae	*Eurema brigitta brigitta*	Broad-bordered grass yellow	Least Concern (SABCA 2013)
Pieridae	*Eurema desjardinsii regularis*	Angled grass yellow	Least Concern (SABCA 2013)
Pieridae	*Eurema hecabe solifera*	Lowveld yellow	Least Concern (SABCA 2013)
Pieridae	*Leptosia alcesta inalcesta*	African wood white	Least Concern (SABCA 2013)
Pieridae	*Mylothris agathina agathina*	Common dotted border	Least Concern (SABCA 2013)
Pieridae	*Mylothris rueppellii haemus*	Twin dotted border	Least Concern (SABCA 2013)
Pieridae	*Pinacopteryx eriphia eriphia*	Zebra white	Least Concern (SABCA 2013)
Pieridae	*Pontia helice helice*	Common meadow white	Least Concern (SABCA 2013)
Hesperiidae	*Afrogegenes letterstedti*	Common hottentot	Least Concern (SABCA 2013)
Hesperiidae	*Pelopidas thrax*	White-banded swift	Least Concern (SABCA 2013)
Nymphalidae	*Danaus chrysippus orientis*	African monarch, Plain tiger	Least Concern (SABCA 2013)
Nymphalidae	*Junonia orithya madagascariensis*	Eyed pansy	Least Concern (SABCA 2013)
Nymphalidae	*Precis octavia sesamus*	Gaudy Commodore	Least Concern (SABCA 2013)
Nymphalidae	*Ypthima impura paupera*	Impure ringlet	Least Concern (SABCA 2013)

10.9.5 Species of Special Conservation Concern

A total of eight faunal and 23 avifaunal species potentially found in the project areas are listed in the IUCN Red List of Threatened Species. This includes Critically Endangered (CR), Endangered (EN), Near Threatened (NT), and Vulnerable (VU) species. These have been listed in the preceding chapters.

10.10 Air Quality

This section provides the proposed baseline in terms of particulate matter and gaseous pollutants, as measured from the nearest monitoring station in Middelburg.

10.10.1 Particulate Matter (PM_{10})

Annual average of PM_{10} concentration as monitored at Middelburg monitoring station – DEA in 2018 showed an annual average of 48 µg/m^3. An ambient PM_{10} concentration result as compared to national standard 40 µg/m^3 has shown exceedance. However, the results are indicative on the potential increase of PM_{10} due to the mining activities taking place in the region and will be confirmed during the baseline studies by conducting real time measurements by using AqMesh monitor. $PM_{2.5}$ will be assessed and presented in the EIA Phase.

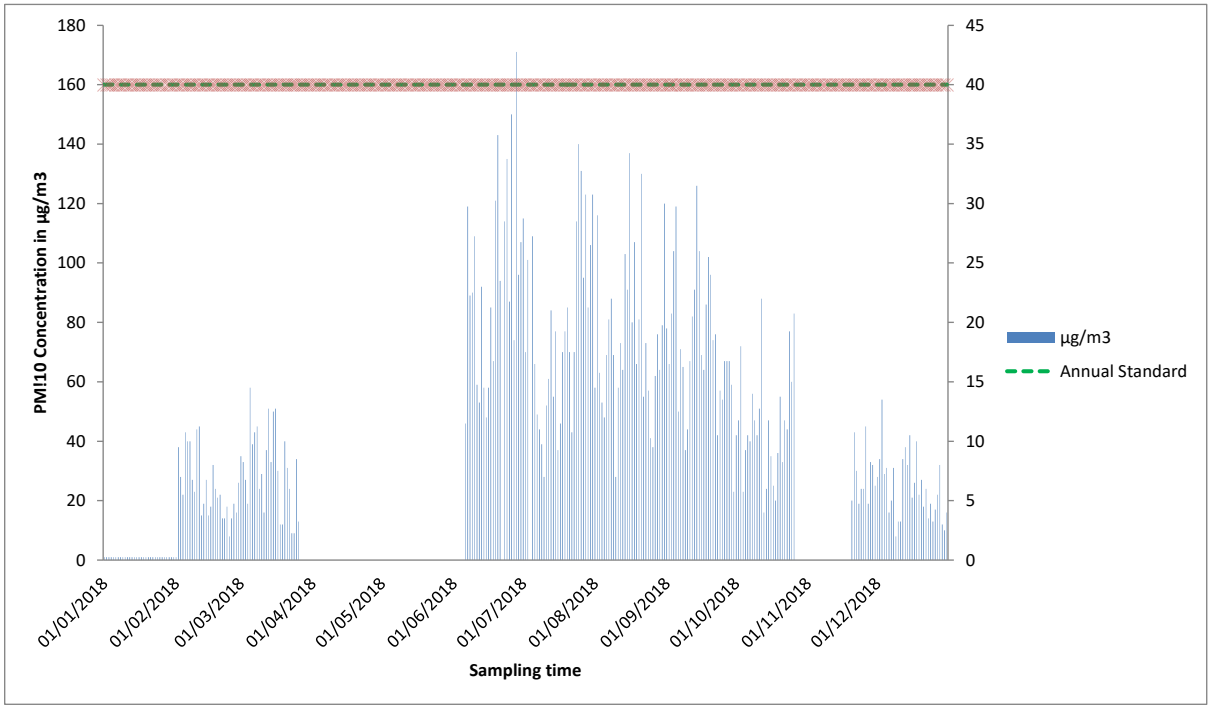


Figure 10-21: PM_{10} Ambient Concentration Monitored at Middelburg Monitoring Station – DEA in 2018

10.10.2 Sulfur Dioxide (SO_2)

The hourly average ambient concentrations of SO_2 measured at Middelburg monitoring station – DEA in 2018 was 7ppb (Figure 10-22) and are within the South African national regulatory limits (134 ppb Hourly average).

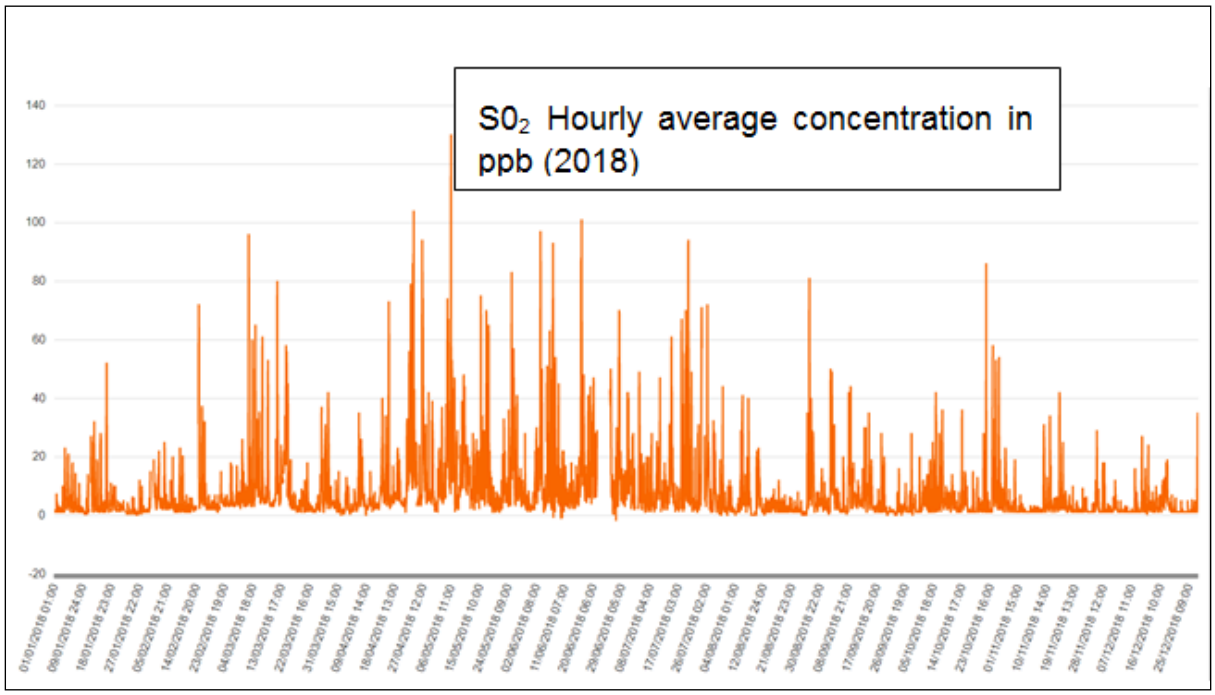


Figure 10-22: SO_2 Middelburg monitoring station – DEA in 2018

10.10.3 Nitrogen Dioxide (NO_2)

The hourly average of $N0_2$ was 16 ppb and the results are portrayed in Figure 10-23, which is below as establish by the National Ambient Standards (106 ppb hourly average).

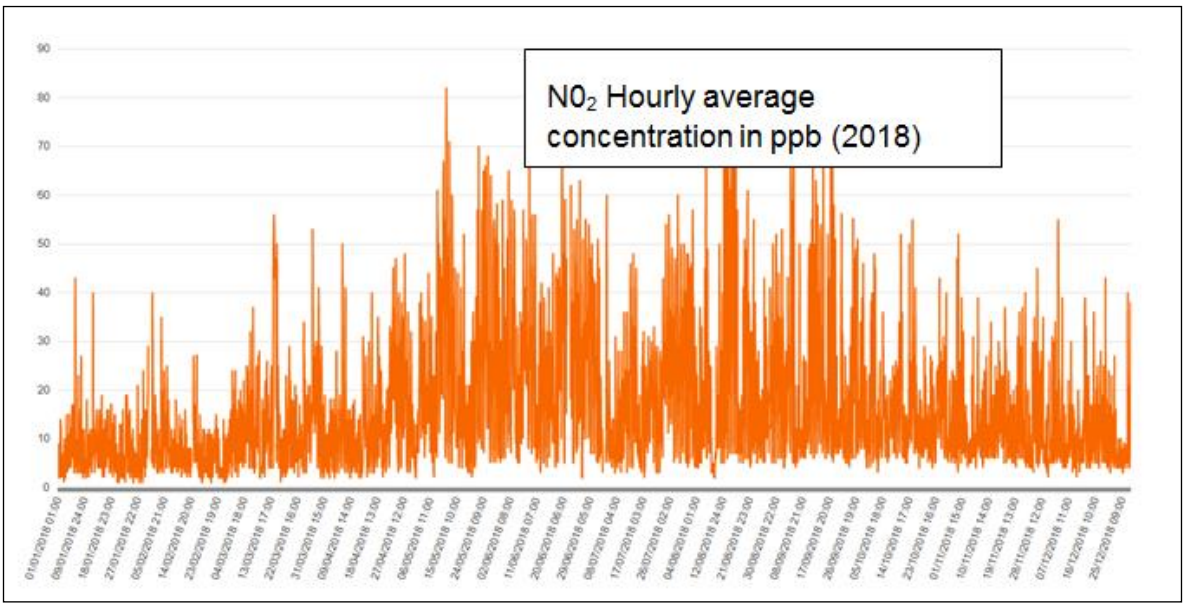


Figure 10-23:NO_2 Hourly average concentration Middelburg monitoring station – DEA in 2018

10.11 Noise

The current expected noise soundscape of the study area has been characterised by considering the land use types and the zoning areas to describe the likely noise levels of the surrounding area. During the Impact Assessment Phase, the noise levels will be more accurately characterized by qualitative baseline noise measurements.

The soundscape in the vicinity of the project is influenced by traffic from the N4 and R33 roads where the main sources of noise are vehicles travelling along those roads. In term of the Noise Assessment, the project area is classified as rural districts as defined within the SANS)10103:2008 where the daytime and night-time limit is set to 45 ad 35 dBA respectively.

The region, in general, has very productive agricultural land due the relatively high rainfall when compared to other parts of South Africa. Apart from the commercial farmers in the surrounding area, few receptors are in close proximity to the project area. There are some homesteads located at the southern and eastern portions of the project. The noise levels are expected to increase within zones of heavy traffic during the project construction and operational phases during daytime and night-time.

The countryside is characterised as very gently undulating, and the present topography is expected to provide little natural screening against the propagation of noise. This is especially true for the low frequency noise typically generated by diesel-powered equipment (Malherbe, F le R. 2002).

From the previous studies in the region, acoustic ground conditions may be assumed to be 'soft', which will affect the propagation of noise from the source to the receiver. In winter, when fields are bare, this natural mitigation may be considerably reduced (Malherbe, F le R.2002).

10.12 Socio-Economic

Primary and secondary study areas for this socio-economic baseline are described below. The former comprises of Ward 1, where the Project is located, as well Wards 3 and 8 that hosts Siyathuthuka and Belfast. It is expected that these areas could experience the greatest impacts from the Project development. The secondary area that could be impacted on comprises the Emakhazeni Local Municipality, the Nkangala District Municipality as well the Mpumalanga Province in which the Project is located.

Detailed information contained herein is predominantly provided for the primary study area.

10.12.1 Primary Study Area

For the purposes of this study, the primary study area comprises of all the properties in the Xivono project area as well as Ward 1 in which they are located. Two large settlements near the project site are also considered as part of the primary study area, as they could experience the greatest impacts because of their sizes and proximity to the Project site. These settlements have also been identified by the client as potential sites for Social and Labour Plan interventions:

- The first is the Siyathuthuka township. Ward 3 in its entirety forms part of the Siyathuthuka township and will be used as an approximate representation of Siyathuthuka. Ward 3 is adjacent to Ward 1 (which hosts the Project site) and has been included as part of the primary study area.
- The second settlement that is considered in the primary study area is the town of Belfast, which is now also known as the town of Emakhazeni. The town is referred to as "Belfast" in this report to differentiate it from the Emakhazeni Local Municipality it is situated in. Belfast is located in Ward 8, which has been included in the primary area of study as data is easily available at this level in Wazimap. It is noted that Belfast hosted 79% of residents of Ward 8 in 2011, and Ward 8 lies adjacent to the Project site. The baseline includes specific data on Belfast where it was readily available, for example, AfriGIS (2019). Ward 8 has also been included together with Wards 1 and 3 as part of the primary study area.

There are currently residents and businesses on the properties where the Project will be located. Consultations will be held with the residents and business owners during the Impact Assessment phase. Data obtained during these consultations will be used to update the baseline and assess potential impacts for the primary study area.

10.12.2 Secondary Study Area

The secondary study area is comprised of the three government administrative areas of the Emakhazeni Local Municipality, the Nkangala District Municipality and the Mpumalanga Province. The wards in the primary study area and the government administrative spheres in the secondary area are indicated in Table 10-16.

Table 10-16: Primary and Secondary Study Area

Primary	Secondary		
Wards	**Local Municipality**	**District Municipality**	**Province**
1, 3 and 8	Emakhazeni	Nkangala	Mpumalanga

Relevant socio-economic baseline information at the ward, the local and district municipalities, and the provincial spheres of administration is provided in this report, within the national context where pertinent.

10.12.3 Economic Profiles

The economic profiles for the Mpumalanga Province, the Nkangala District and Emakhazeni Local Municipalities are discussed in this section.

10.12.3.1 Mpumalanga Province

The development of the Strategic Plan of the Mpumalanga Department of Economic Development and Tourism (MDEDT) for the period 2015 to 2020 is based on new priorities for the Mpumalanga administration and aims to fast track growth, support priority sectors, create jobs and promote economic participation by all its people. The Department's vision is for a "*an inclusive, global competitive economy*" and its mission is "*to drive economic growth that creates decent employment and promote sustainable development through partnership*".

The implementation of the plan is founded on Outcome 4 of national government's Medium-Term Strategic Framework (MTSF) for 2015 to 2010, which is, "*Decent employment through inclusive growth*".

According to the strategy, the province has at least 80% of the coal reserves in South Africa. There is also a large forestry sector and a strong agricultural sector with the potential to absorb lower skilled labour. The active mining, agricultural and forestry sectors also provide possibilities for beneficiation. The province is strategically located with access to inland provinces and proximity to Swaziland and Mozambique, including the Maputo port. Although infrastructure, that is, roads, transport and logistics, electricity, water, telecommunications and medical care, is regarded as generally good there is also an acknowledgement that rural infrastructure is poor. The natural landscape in the province is ideal to stimulate tourism. The Department has developed good working relations with its stakeholders. It however recognises the need for improving alignment amongst stakeholders in the province.

Mpumalanga Premier Mtshweni in her State of the Province Address on 22 February 2019 (Mpumalanga Provincial Government, 2019) stated that the provincial economy grew at 3% in 2014 but last year recorded a rate of less than 1%. The Mpumalanga Strategy identifies five prioritised economic sectors in the province, namely, agriculture for the promotion of agro-processing, mining for value addition through beneficiation and energy generation, manufacturing, Information Communication Technology, and tourism and cultural industries for job creation and growth of Small, Medium and Micro Enterprises (SMMEs). The department is promoting collaboration amongst departments in all spheres of government and with the private sector, to put together a comprehensive support package for SMMEs and co-operatives.

The proposed mine could contribute towards the priority provincial economic sector of mining for value add as energy generation.

10.12.3.2 Nkangala District Municipality

According to the Nkangala District Municipality IDP (Nkangala District Municipality, 2019), of the five local municipalities within the boundary of Nkangala District Municipality (NDM), Emalahleni Local Municipality had the largest population of 395 466 or 30% of the district population, and Emakhazeni Local Municipality had the smallest population of 47 216 people or 3.6% of the district population.

The vision of the NDM is an "*Improved quality of life for all*". The NDM's strategic goals and how they are aligned with the municipality's developmental objectives are depicted Table 10-17.

Table 10-17: Alignment of the NDM's Strategic Goals to NDM's Development Objectives

Developmental Objectives	Strategic Goals
Integrated Sustainable Human Settlements and improved quality of household life	Integrated Regionalised Planning
Efficient, competitive and responsive economic infrastructure network	Sustainable Infrastructure and Service Provisioning
Decent employment through inclusive economic growth	Inclusive Economic Growth
Inculcate and improve financial sustainability and management	Sound Financial Management
Responsive, accountable, effective, efficient and sound Governance System	Sound Electronic Governance
Skilled and capable workforce supportive of inclusive growth	Competent, Innovative and Accountable Team
Vibrant, equitable and sustainable rural communities and food security	Healthy Social Environment

Developmental Objectives	Strategic Goals
Protection and enhancement of environmental assets and natural resources	Healthy Social Environment

The NDM's Gross Domestic Product (GDP) of R 121 billion in 2016 represented a 36.89% contribution to the Mpumalanga Province GDP of R 328 billion. The NDM was the largest contributor (37%) to the GDP of Mpumalanga, ahead of Ehlanzeni and Gert Sibande District Municipalities that contributed 35% and 28% respectively.

The NDM's economy is made up of various industries. In 2016, the mining sector was the largest contributor of R 41.1 billion or 37.3% of the total Gross Value Added by Region (GVA-R)[3] in the district municipality's economy. The sector that contributed the second most to the GVA of the NDM during the same period was the manufacturing sector at 12.0%, followed by the community services sector with 11.4%.

Limited economic activity in Emakhazeni and Victor Khanye local municipalities in the NDM has resulted in relatively modest levels of economic growth and development in these two local municipalities in the district. The GDP in these two municipalities accounted for approximately 6% and 3% of respectively of district GDP share in 2016. Poverty pockets were noted in peri-urban areas of all local municipalities within the boundary of the NDM; these were where most informal settlements, townships and rural settlements were found. The mine can therefore contribute towards economic development in the Emakhazeni Local Municipality, the smallest local municipal contributor to the district GDP. Priority needs determined for Emakhazeni Local Municipality during NDM's community outreach meetings in October 2017 constituted of RDP Houses, land use management for advancement of human settlements, building and maintenance of infrastructure, and provision of basic services at farm wards.

10.12.3.3 Emakhazeni Local Municipality

Emakhazeni Local Municipality (ELM) is situated on the N4 national highway linking the Gauteng and Mpumalanga Provinces and Mozambique. Within the Mpumalanga Province, it strategically links Pretoria and Johannesburg with Nelspruit. The ELM is thus regarded as the gateway to major tourism areas in Mpumalanga such as the Kruger National Park. There are also some prime trout fishing areas and scenic landscapes in the ELM. A railway line links Gauteng to Belfast/Emakhazeni and continues to the east, through Nelspruit, to the Maputo harbour. From this main line there are two lines going south through Ermelo to the Richards Bay harbour. There is also a railway line going north from the Emakhazeni (Belfast) station through Dullstroom towards Lydenburg.

[3] The GVA-R variable provides a sector breakdown, where each sector is measured in terms of its value added produced in the local economy.

Farming in ELM occupies the largest physical area in the municipality. Small towns that serve as service centres to the agricultural sector are:

- Emakhazeni (Belfast) and Siyathuthuka;
- Dullstroom and Sakhelwe;
- Entokozweni and Emthonjeni; and
- Waterval-Boven and Emgwenya.

Copper, nickel, cobalt, arsenic, platinum, zink and silver are found north of Emakhazeni/ Belfast, and flint clay is found at Emakhazeni/Belfast. Chrome-iron extracted in Zeerust and Rustenburg is processed at the Assmang Chrome (previously Feralloys) Plant in Entokozweni. Mining made the greatest contribution (25.8%) towards the GDP of the ELM in 2016, and was followed by community services (14.9%), trade (14.6%), transport (10.2%), finance (10.1%), manufacturing (9.8%) and agriculture (7.3%). Both the agriculture and mining sectors have experienced volatile growth over the last 14 years.

10.12.4 Baseline Profile of Emakhazeni Local Municipality

10.12.4.1 Population size and density

Of the three project-affected wards in Emakhazeni LM, Ward 3 had the largest population and the greatest density (4 675 persons per km^2) (Table 10-18). Ward 1 had a population density of 17.4 persons per km^2, which was greater than the average density for the local municipality (10 persons per km^2). Of the 5 623 people in Ward 8, 4 467 (79%) resided in Belfast (AfriGIS, 2019); the population density therefore was much greater in Belfast compared with Ward 8 as a whole (which was 14.1 persons per km^2).

The population in Siyathuthuka however in the same period was 12 156 (AfriGIS, 2019). It is noted that Siyathuthuka occupies less than one-fifth of the land area that Belfast occupies; Siyathuthuka therefore was much more densely populated when compared to Belfast.

Table 10-18: Population in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Population size	5 853	6 181	5 623
Population density (per km^2)	17.4	4 675.5	14.1

The populations recorded at provincial, district municipality and local municipality spheres are indicated in Table 10-19. The district municipality had a higher population density (1.5 times greater) than the province. It is noted from Census 2011 data that the population density amongst the 8 wards in the local municipality varied considerably - between 3 persons per km^2 (in Ward 5, which is 1 467.6 km^2 in extent) to 4 675 persons per km^2 (Ward 3, which is 1.3 km^2 in extent).

Table 10-19: Population in the Secondary Study Area

	Emakhazeni Local Municipality	Nkangala District Municipality	Mpumalanga Province
Population	47 216	1 308 129	4 039 939
Population density (per km^2)	10.0	77.4	52.8

10.12.4.2 Population groups

The predominant population group in Belfast in 2011 was White (2 346 persons or 53%), followed by Black African (1 785 persons or 40%) (AfriGIS, 2019). In contrast, 12 048 persons (or 99% of the population) in Siyathuthuka were Black African (AfriGIS, 2019). This was reflected in population groups for Ward 3 (99% Black African) and Ward 8 as a whole (43% White and 51% Black African). Ward 1, where the proposed mine is located, had a population that was 99% Black African. Approximately 10% of the population at the local and district levels were White. The proportion of Black African increases as one proceeds from local to district and then provincial spheres.

Table 10-20: Population Groups (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Black African	99.1	98.6	51
Coloured	0.3	0.7	3.5
Indian or Asian	0	0.2	2.1
White	0.6	0.3	43.3

10.12.4.3 Age and Gender

There were equal proportions of males and females in Wards 1 and 3; however, there were slightly more men in Ward 8 (in a ratio of 52:48). Ward 3 had the highest proportion of people of working age (61%); this was slightly higher than in Ward 8 (59%) and Ward 1 (57%). Ward 1 had the highest proportion of children and lowest percentage of elderly when compared with local, district and provincial populations. Dependency rates on the economically active population can therefore be expected to be high if children do not receive social grants and if the elderly do not receive pensions. There were almost equal numbers of males and females at the three administrative spheres. This was the case in Bethal and Siyathuthuka as well (AfriGIS, 2019). Approximately 60% of the population at the local, district and provincial levels were of working age.

Table 10-21: Age and Gender in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Male:Female Ratio	50:50	50:50	52:48
Working Age (18 to 64 years old)	57%	61%	59%
Under 18 years old	40%	34%	31%
65 years and older	3%	6%	9%

10.12.4.4 Language

IsiZulu was the most commonly spoken language in Wards 1 and 3. Afrikaans was the most commonly spoken language in Ward 8. SiSwati was the most commonly spoken language at all administrative spheres in the secondary study area.

Table 10-22: Most Spoken Languages (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
SiSwati	14	12	7
isiZulu	37	46	15
IsiNdebele	29	21	13
Afrikaans	-	-	43

10.12.4.5 Migration

Ward 8 had the smallest proportion of people born in the province of Mpumalanga (66%) compared with Ward 1 (90%) and Ward 3 (86%). The local municipality had the highest proportion of people (89%) who were born in Mpumalanga Province, demonstrating the lowest proportion of migrants from neighbouring provinces of Gauteng and Limpopo as well as from outside the country.

Table 10-23: Province of Birth (%) for Primary Study Area:

	Ward 1	Ward 3	Ward 8
Mpumalanga	90	86	66
Limpopo	3.6	2	4
Outside South Africa	1.5	-	3
Gauteng	1.4	-	9
Kwa Zulu Natal	-	2	3

10.12.4.6 Women and Child-headed Households

Of the 3 wards, Ward 3 had the largest proportion of households headed by women (47%) and Ward 8 has the lowest (30%). There were a larger proportion of women-headed households (40%) in the ward when compared with the proportions in the local and district municipality. Ward 3 also had the largest proportion of child-headed households (0.6%). When compared with the district and local municipalities, the proportion of child headed households was the greatest at provincial level (0.9%).

Table 10-24: Women and Child-headed Households (in %) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Women-headed (percentage of households)	40	47	30
Child-headed (percentage of households)	0.4%	0.6%	0.5%

10.12.4.7 Education Levels

Amongst the 3 wards, Ward 1 had the greatest proportion of people 20 years and older who had completed some secondary education (36%). Ward 8 had the greatest proportion that had completed matric (36%), followed by Ward 3 (33%) and Ward 1 (30%). Ward 8 the highest proportions of undergraduates and postgraduates, which were 5% and 2% respectively.

Table 10-25: Population 20 Years and Older by Highest Education Leven (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
None	15	12	9
Some primary	12	11	6
Primary	6	4	4
Some secondary	36	31	30
Grade 12 (Matric	30	33	36
Undergraduate	1	2	5
Postgraduate	0	1	2

10.12.4.8 Employment and Unemployment

Wards 1 and 8 had a much higher proportion of employed people in the population 15 years and older (approximately 48%) when compared with Ward 3 (29%). The proportion of those unemployed in this age group was however higher in Ward 1 when compared with the other two wards. The proportion of people in this age group who are economically not active,

unemployed, discouraged work seekers and in the “not applicable” categories indicates the high levels of dependency on those that are employed in a household. This is highest in Ward 3, where the total proportion of people in these categories is 70%. Employment in the local municipality was higher (29%) compared with the district (27%) and province (24%). The proportion of people in this age group who are economically not active, unemployed, discouraged work seekers and in the “not applicable” categories indicates the high levels of dependency on those that are employed in a household. Amongst the wards, this is highest in Ward 3, where the total proportion of people in these categories is 70%. At the three administrative levels the highest proportion was found in the local municipality (81%), due to the high proportion of not economically active individuals (67.6%).

Table 10-26: Employment Status (5) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Employed	47	29	48
Unemployed	20	12	11
Discouraged work seekers	4	6	4
Not applicable or not economically active	29	52	37

10.12.4.9 Individual Annual Income

In the primary study area, Ward 1 had the highest proportion of employed individuals with no income (10%). Ward 1 also had the highest proportions of employed people earning up to R20 000 (34%) and earning from R20 001 to R40 000 (29%). The comparative proportions of employed people earning annual incomes in the lower brackets of less than R40 001 in Ward 3 and Ward 8 were 55% and 46% respectively. At all spheres of administration; most employed individuals were earning annual incomes in the categories between R1 and R150 000. It is noted that many employed people (at least 7%) were not earning an income. Those households earning R0 to R40 000 constituted 55% of households in the local municipality, 45% of households in the district municipality and 47% in the province.

Table 10-27: Income Bracket of Employed Individuals (%) in Primary Study Area

	Ward 1	Ward 3	Ward 8
No income	10	7	6
R1 to R20 000	34	22	23
R20 001 to R40 000	29	26	17
R40 001 to R75 000	15	20	16
R75 001 to R150 000	7	15	16
R150 000 to R300 000	2	5	11

	Ward 1	Ward 3	Ward 8
R300 000 to R600 000	1	1	5

10.12.4.10 Annual Household Income

Amongst the wards, the greatest proportion of households with no income was Ward 3 (18%). An additional 24% of households in Ward 3 were in the R1 to R20 000 category. Ward 3 therefore had the greatest proportion of households with annual incomes of R0 to R20 000 (42%). These households will struggle to meet their daily basic needs. In contrast, the comparative proportion in Ward 1 is 14.8% and in Ward 8 it is 26%.

Table 10-28: Annual Income Brackets of Households (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
No income	8.6	18	6
R1 to R20 000	6.2	24	20
R20 001 to R40 000	18.2	20	21
R40 001 to R75 000	26.3	18	15
R75 001 to R150 000	21.2	13	15
R150 001 to R300 000	9.9	5	13
R300 001 to R600 000	3.7	2	6
R600 001+	1	0	4

Siyathuthuka had twice the number of households with no annual income, compared to Belfast. The former also had almost twice the proportion of households (17%) with annual income from R0 to R4 800. Belfast has greater proportions of households in the higher middle-income brackets from R76 801 to more than R614 401. Overall, the local municipality has a lower proportion of households with no income, when compared with the district and the province. The highest proportion of households in the categories from R0 to R40 000 were in the province (68%), followed by the local municipality (63%) and then the district municipality (61%). Large proportions of the households at the 3 administrative levels therefore have annual income levels of less than R40 000.

Table 10-29: Annual Income Brackets of Households (%) in Belfast and Siyathutuka

	Belfast (% of HH)	Siyathuthuka (% of HH)
No income	7	14
R1 to R4 800	2	3
R4 801 to R9 600	2	5
R9 601 – R19 200	13	18

	Belfast (% of HH)	Siyathuthuka (% of HH)
R19201 – R38 400	19	22
R38 401 – R76 800	14	20
R76 801 – R153 600	17	12
R153 601 – R307 200	15	4
R307 201 – R614 400	8	2
R614 401 +	3	1

10.12.4.11 Service Delivery

10.12.4.11.1 Water

Almost all households (99%) in Ward 3 were receiving water from a regional or local service provider, compared with Wards 1 and 8. More households were accessing water from a borehole in Ward 1 (11%) and in Ward 8 (9%), when compared with Ward 3.

In the local municipality, 79% of households were accessing water from a service provider. This was about 90% of the rate in the district (89%) and a little higher than the rate in the province (74%).

Table 10-30: Household Access to Water (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Water from a regional or local service provider	82	99	79
Borehole	11	0	9
Tanker	2	0	-
Spring	2	0	-
Dam	-	-	3
Other	3	0	4

10.12.4.11.2 Sanitation and Toilet Facilities

Most households (98%) in Ward 3 have access to flush or chemical toilets. Households in Wards 1 and 8 had alternative sanitation facilities, including a pit latrine without ventilation (11% in Ward 8 and 3% in Ward 1). Some households in Ward 1 were also depending on bucket latrines.

Eighty one percent (81%) of households in the local municipality have access to flush or chemical toilets. This represents about 1.5 times the rate in Nkangala (54%) and more than

1.5 times the rate in Mpumalanga (45%). However, 6.3% of the population did not have access to any toilets. This is more than double the rate in the district (1%) and the province (3%).

Table 10-31: Household Access to Sanitation in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Flush or chemical toilets	91	98	75
Pit latrine without ventilation	3	0	11
Bucket latrine	2	1	-
Other	3	0	5
None	1.6	0.2	3

10.12.4.11.3 Electricity

Wazimap does not provide Census 2011 data adjusted to 2016 ward boundaries for access to electricity. 2016 Community Survey data was however available from Wazimap at the local and district municipal levels and the provincial level. Most households in the local municipality (74%), the district municipality (76%) and the province (81%) had pre-paid meters. The local municipality had the largest proportion of the population without access to electricity (17%) compared with the district (9%) and the province (7%). Slightly larger proportions of the populations at district and the province (1% in both cases) compared with the local municipality (0%) were connected to a source that the household was not paying for.

Table 10-32: Household Access to Energy (%) in the Secondary Study Area

	Emakhazeni Local Municipality	Nkangala District Municipality	Mpumalanga Province
Connected to other source which household is not paying for	0%	1%	1%
Connected to other source which household pays for	1%	1%	1%
In-house conventional meter	6%	12%	10%
In-house prepaid meter	74%	76%	81%
No access to electricity	17%	9%	7%
Other	1%	1%	1%

	Emakhazeni Local Municipality	Nkangala District Municipality	Mpumalanga Province
Total	100%	100%	100%

10.12.4.11.4 Refuse Disposal

All households (100%) in Ward 3 receive regular refuse removal services from the local authority or private company. In Ward 1, 81% of households were receiving regular refuse removal services from the local authority or private company, and in Ward 8 the proportion was even less (67%). Households in the latter 2 wards therefore had to make alternative arrangements such as establishing their own dumps.

At the local municipality level, 73.1% of households were getting refuse disposal from a local authority or private company. This was about 20% higher than the rate in the district (46%) (Census, 2011a) and about 1.5 times the rate in Mpumalanga (37%) (Census, 2011c).

Table 10-33: Population Groups (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
Local authority or private company	81	100	67
Own dump	14	0	14
Service provider	0	0	-
Other	-	-	9
None	5	0	8

10.12.4.11.5 Housing

Ninety three percent (93%) of households in Ward 3 occupied a formal house. Amongst the three wards, the largest proportion of traditional homes and informal housing was found in Ward 8.

At the local municipality level, 75% of households lived in houses. This represented about the same as the rate in the district (74%) (Census, 2011a) and a little less than the proportion in the province (77%) (Census, 2011c).

Table 10-34: Population Groups (%) in the Primary Study Area

	Ward 1	Ward 3	Ward 8
House	90	93	67
Traditional	2	0	6
Shack	6	3	10
Other	1	2	11

10.12.4.12 HIV/AIDS Prevalence

According to ELM's Integrated Development Plan (Emakhazeni Local Municipality, 2019) the HIV prevalence rate of Emakhazeni increased from 41% in 2012 to 45.5% 2013. This also represented the 5th highest prevalence rate amongst all municipal areas in the Province.

10.13 Cultural Heritage

The cultural heritage baseline description considered the predominant landscape based on the identified heritage resources within the regional and local study area. Table 10-35 presents the broad timeframes for the major periods of the past in Mpumalanga.

Table 10-35: Periods in Mpumalanga

The Stone Age	Early Stone Age (ESA)	2 million years ago (mya) to 250 thousand years ago (kya)
	Middle Stone Age (MSA)	250 kya to 20 kya
	Later Stone Age (LSA)	20 kya to 500 CE (Common Era[4])
There appears to be a gap in the record in Mpumalanga between approximately 7000 and 2000 BCE.		
Farming Communities	Early Farming communities (EFC)	500 to 1400 CE
	Late Farming Communities (LFC)	1100 to 1800 CE
Historical Period	-	1500 CE to 1994 (Behrens & Swanepoel, 2008)

Adapted from Esterhuysen & Smith (2007)

Figure 10-24 below presents the results of the review of previously completed heritage assessments. In total, 54 heritage resources were identified within the regional, local and site-specific study areas.

[4] Common Era (CE) refers to the same period as *Anno Domini* ("In the year of our Lord", referred to as AD): i.e. the time after the accepted year of the birth of Jesus Christ and which forms the basis of the Julian and Gregorian calendars. Years before this time are referred to as 'Before Christ' (BC) or, here, BCE (Before Common Era).

The predominant tangible heritage resources recorded in the area under consideration demonstrate affiliations with the historical period, dominated by the historical built environment and burial grounds and graves. This notwithstanding, modern heritage resources and a battlefield have been recorded in the greater study area.

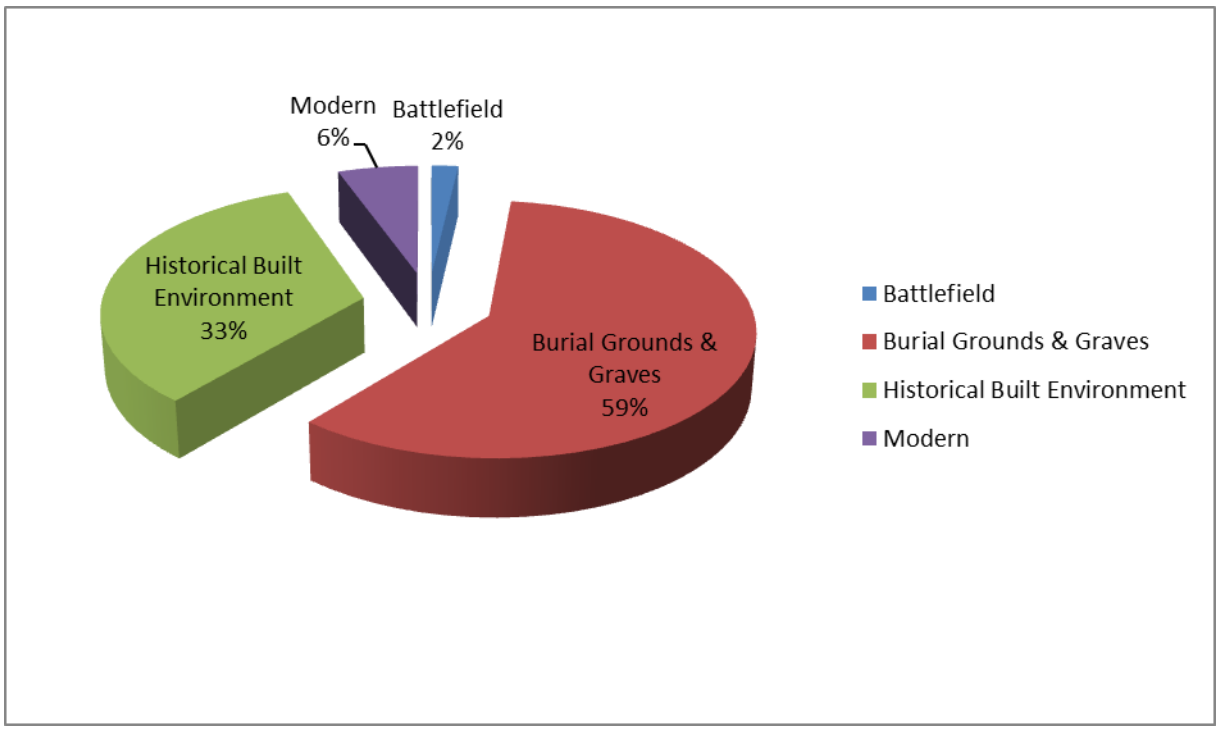


Figure 10-24: Heritage Resources Identified within the Greater Study Area

The geological context and palaeontological sensitivities of the Project area will be described in the Palaeontology Impact Assessment (PIA) report which will be appended to the HIA report.

This section defines the cultural landscape through providing a brief description that offers the reader contextual information, as well as assists the identification of potential risks and impacts to the heritage resources.

10.13.1 Archaeo-Historical Context

The Stone Age in southern Africa comprises three broad phases, which are described according to the lithic tools and material culture produced by the various hominid species through time. These phases are:

- The ESA;
- The MSA; and
- The LSA.

The survey of the previously-completed heritage assessments yielded no expressions of the Stone Age within the regional study area. This notwithstanding, material associated with the MSA and LSA has been recorded within the province and may potentially be uncovered during earth-moving activities. As such, a brief description of these resources follows.

The MSA dates from approximately 300 kya to 20 kya. High proportions of minimally modified blades, created using the Levallois technique, characterise the early MSA lithic industries (Clark, 1982; Deacon & Deacon, 1999). The use of good quality raw material as well as bone tools, ochre, beads and pendants also define this period. The LSA dates between 40 kya to the historical period. LSA lithics are specialised where specific tools have been created for specific tasks (Mitchell, 2002). LSA assemblages can also include bone points and commonly include diagnostic tools such as scrapers and segments.

In southern Africa, the LSA is closely associated with hunter-gatherers. The San (including hunter-gatherer, Basarwa and Bathwa groups) are generally accepted as the first inhabitants of southern Africa and Mpumalanga (Makhura, 2007). Regional hunter-gatherer occupation is well documented, although open sites are usually poorly preserved and difficult to identify because of the nomadic nature of these peoples. Potgeiter (1955) described the San as occupying rock shelters throughout the landscape and creating reed platforms in the Chrissiesmeer Lake.

The LSA, as alluded to above, is further defined by evidence of ritual practices and complex societies (Deacon & Deacon, 1999). Three rock art painting traditions occur within Mpumalanga and are widely dispersed, although they are most notably recorded in the northern and eastern regions. These traditions include fine-line paintings associated with LSA hunter-gatherer groups, finger paintings associated with pastoralists and other finger paintings associated with later, possibly historical, farming communities (Eastwood, et al., 2002; Smith & Ouzman, 2004; Smith & Zubieta, 2007).

The San were later followed by the various peoples of the Farming Community, including ancestors of modern Sotho-Tswana and Nguni peoples (Makhura, 2007). The farming community period correlates to the movements of Bantu-speaking agro-pastoralists moving into southern Africa. The review of previously completed heritage assessments did not include the identification of farming community; however, LFC material has been recorded in the Mpumalanga Province.

The LFC is generally represented by stonewalling or secondary tangible surface indicators, such as ceramics and evidence for domesticated animals, i.e. dung deposits or faunal remains. No stonewalling was identified during the pre-disturbance survey; however, as with the MSA and LSA artefacts, ceramics may be uncovered during earthmoving activities.

Ceramics, among other material culture remains, provide motivation for settlement and possible trade networks (Delius, et al., 2014) and are distributed across the region. Huffman (2007) provides a reference for the possible distribution of ceramic facies within the regional study area. Table 10-36 provides a summary of the ceramic facies within the province.

Table 10-36: Ceramic Facies Commonly Found in Mpumalanga

Facies	Key Characteristics	Period
Uitkomst	Stamped arcades, appliqué and blocks of parallel incisions, stamping and chord impressions	1650 CE – 1820 CE
Rooiberg	Stamped rim band, mixture of stamped and incised bands, arcades and triangles in the neck	1650 CE – 1750 CE
Icon	Multiple incised bands separated by colour and lip decorations on bowls	1300 CE – 1500 CE
Madikwe	Multiple bands of cord impressions, incisions, stabs and punctates separated by colour	1500 CE – 1700 CE
Letaba	Hatched bands on shoulder, below black and red triangles	1600 CE – 1840 CE
Klingbeil	Triangles in neck bordered with slashes, punctates on shoulder	1000 CE – 1200 CE

After Huffman (2007)

The historical period is commonly regarded as the period characterised by contact between Europeans and Bantu-speaking African groups and the written records associated with this interaction. However, the division between the LFC and historical period is largely artificial, and there is a large amount of overlap between the two.

Throughout the transitions between the LFC and the historical period (and through the historical period itself), migration, population growth, climatic variation and trade to the east significantly impacted the Pedi, Koni and other groups on the Mpumalanga Highveld. The rise of power blocs, including violent displacement and political centralisation, characterised this time (Makhura, 2007). The Pedi grew to become the strongest power in the north-east, amongst the escalating conflict and intensifying violence (Delius, et al., 2014).

In the Nguni region, similar processes played out, contributing to the rise of several large, aggressive states, including: the Ndwandwe, the Mthethwa, the Swazi and the Zulu Kingdom. Skirmishes between these groups resulted in several battles, the pillaging of settlements and the movement of various groups into the interior; both the Pedi and the Koni suffered the severe consequences. While the Ndwandwe, the Swazi and the Ndebele (led by Mzilikazi) were seen as the dominant forces on the landscape, smaller groups of invaders and raiders contributed to these events (Delius, et al., 2014).

An example of the overlap between the LFC and the historical period is the Mfecane or, north of the Orange River, the Difaqane. These terms refer to a period of violence and unrest between approximately 1817 to 1826 AD (Landau, 2010). Many aspects of the Mfecane/Difaqane have been debated and challenged. The traditional understanding of the period is that the Zulu group led by Shaka pushed Mzilikazi and his Ndebele group out of the latter's territory. This displacement had a knock-on effect, as multiple groups were subsequently displaced to the north and the west. A drought during this time worsened the

instability and increased the pressure on the already low food supplies. European settlers, traders, missionaries and travellers moving into the interior further added to instability and resulting power struggles. The Mfecane/Difaqane was characterised by unprecedented (at least within the records of the Europeans travelling within southern Africa) social and political mobilisation and violence across the Highveld as individuals sought personal and food security.

As a result of social and political upheaval, the Mpumalanga Highveld was vulnerable to intrusive groups including the Swazi and the Voortrekkers. Groups of Afrikaners initiated a move from the Cape to the interior to establish an independent state in approximately 1835, in reaction to increased British liberalism and the abolishment of slavery and pass laws. The migration of these Voortrekkers is commonly referred to as the Great Trek (or Groot Trek) and it started with the first group, the Robert Schoon Party, in 1836. The first permanent settlement that was established as a result of this movement was Ohrigstad in 1845 – the Voortrekkers at this time were intruding into an already volatile interior and aggravated the strife in this area, frequently skirmishing with remnant Pedi, Nduzundza Ndebele and Kopa groups (Delius & Cope, 2007; Voortrekkers, 2014).

Following the settlement at Ohrigstad, internal tensions amongst the Trekkers, exacerbated by malaria and stock disease, resulted in the movement of people from the town (Delius, 2007). Farmers settled in the Belfast area from 1847, when they moved from the Lydenburg region looking for healthier environments for themselves and their cattle.

Soon after settling in the Mpumalanga Highveld area, the Trekboers (now farmers) discovered and exploited the Highveld Coalfields. The Boers originally used the coal as a domestic resource; however the discovery of gold in the Witwatersrand in 1886 created an enormous demand for this coal (Brodie, 2008; Pistorious, 2008a; 2008b). The increase in demand drove the commercial exploitation of the coal, until the outbreak of war put a hold on the industry. A small colliery located on the farm Paardeplaats, west of Belfast, mined coal from the 1890s, until the colliery was abandoned in the 1920s.

The South African War of 1899-1902 (previously referred to as the Second Anglo-Boer War) officially started on October 9th, 1899. The war was the result of building tensions and conflicting political agendas between the Trekboers and the British. There are two notable battles associated with the South African War within the regional study area: the Battles of Lake Chrissie (February 6th, 190) and Bakenlaagte (October 30th, 1901), approximately 70 km southeast and 110 km southwest of the Project area respectively. The battlefield included in Figure 10-24 relates to the latter battle. No major military engagements related to the war are known for the Belfast area.

10.13.2 Existing Environment

The Project exists within the Mesic Highveld bio-region of the Grassland Biome. Table 10-37 presents a summary of the natural setting of the Project, as described by Mucina and Rutherford (2010).

Table 10-37: Summary of the vegetation setting of the Project

Biome	Bio-region	Vegetation Type
Grassland	Mesic Highveld Grassland	Eastern Highveld Grassland (Gm12) This vegetation unit is located on slightly to moderately undulating plains, including low hills and pan depressions. This unit is usually found at altitudes between 1 520 m and 1 780 m but can also be found at altitudes of 1 300 m. This unit is associated with the shales and sandstones of the Madzaringwe Formation of the Karoo Supergroup. Vegetation consists of short, dense grassland dominated by typical Highveld grass species, with small, scattered rocky outcrops, patches of wiry sour grasses and some woody species. This unit type is considered endangered and small portions are conserved in statutory and private reserves. Cultivation has had the largest impact on transforming this vegetation type, but plantations, mines, urbanisation and the construction of dams have also contributed to this transformation. Erosion is low in this type.

Adapted from Mucina & Rutherford (2010)

The natural vegetation has been disturbed to varying degrees by human activities. The land use is predominantly agriculture (primarily maize and cattle) and mining activities associated with the Matla and Kriel Power Stations near to the site-specific study area. A plantation has been established within and adjacent to the Project area. Figure 10-25 below presents the current environment at the time of the pre-disturbance survey.

Figure 10-25: Current Environment within the Project Area

10.13.3 Results from the Pre-Disturbance Survey and Historical Imagery

Shannon Hardwick undertook the pre-disturbance survey on 02 to 03 and 06 to 07 May 2019. Table 10-38 presents a description of the results identified during the survey. Figure 10-26 presents photographs of select heritage resources also includes the results of the historical layering exercise. Historical layering was undertaken to identify potential structures that may be older than 60 years and would therefore be protected under Section 34 of the NHRA and stonewalling which would be protected under Section 35 of the NHRA.

No stonewalling is visible on the historical imagery. The points HLP-01 and HLP-02 refer to two dam walls visible in the 1955 imagery and which are still in use at present. No photographs were taken of these structures. Wf-001 refers to a werf which includes a mix of modern and historical structures, as described in Table 10-38 and presented in Figure 10-26. STE-001 was identified during the pre-disturbance survey and is visible on the 1955 imagery.

Table 10-38: Heritage Resources identified through the pre-disturbance survey[5]

Site Name	Description
BGG-001	Burial ground demarcated by fencing – this fencing appears to have been erected in two phases, as there are two different styles and one type of fence has deteriorated. The burial ground includes 10 visible graves, one of which is outside the fence perimeter. This appears to be a child grave. Of all the graves, seven were marked with stone and soil piles. One of these graves is marked with a white cross and marker and two are indicated by small metal markers. One had no headstone. No names or dates were visible on these markers. One grave was marked by brick fittings with a brick headstone (this may also be a child grave). Another grave was marked by brick fittings with no headstone. One grave had granite fittings, slab and headstone with a legible name and date. This grave belongs to the Mthimunye family and dates to 1990.
Wf-001	An extensive werf with a mix of historical and modern structures. The werf includes a farmhouse, animal pens, barns and several other structures, some of which appear to be housing. Some of these structures have thatched roofs, while others have tin. The barn appears in the historical imagery. Some of the modern structures appear in an area which appears to have been a dense treeline or windbreak in the historical imagery. These structures are presently in use. There is one ruined structure and one stone animal pen in proximity to the werf. These do not appear on the historical imagery, but this may be because of their size. The age of these structures has therefore not been verified.
Wf-002	A werf with a mix of historical and modern structures. One of the structures is visible on the historical layering – this is most likely the Zoekop farmhouse or barn. These structures are currently in use.

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

Figure 10-26: Select Heritage Resources Identified -

A.) BGG-001; B.) and C.) Mix of historical and modern structures at Wf-001; D.) derelict structure in proximity to Wf-001; E.) and F.) Mix of historical and modern structures at Wf-002

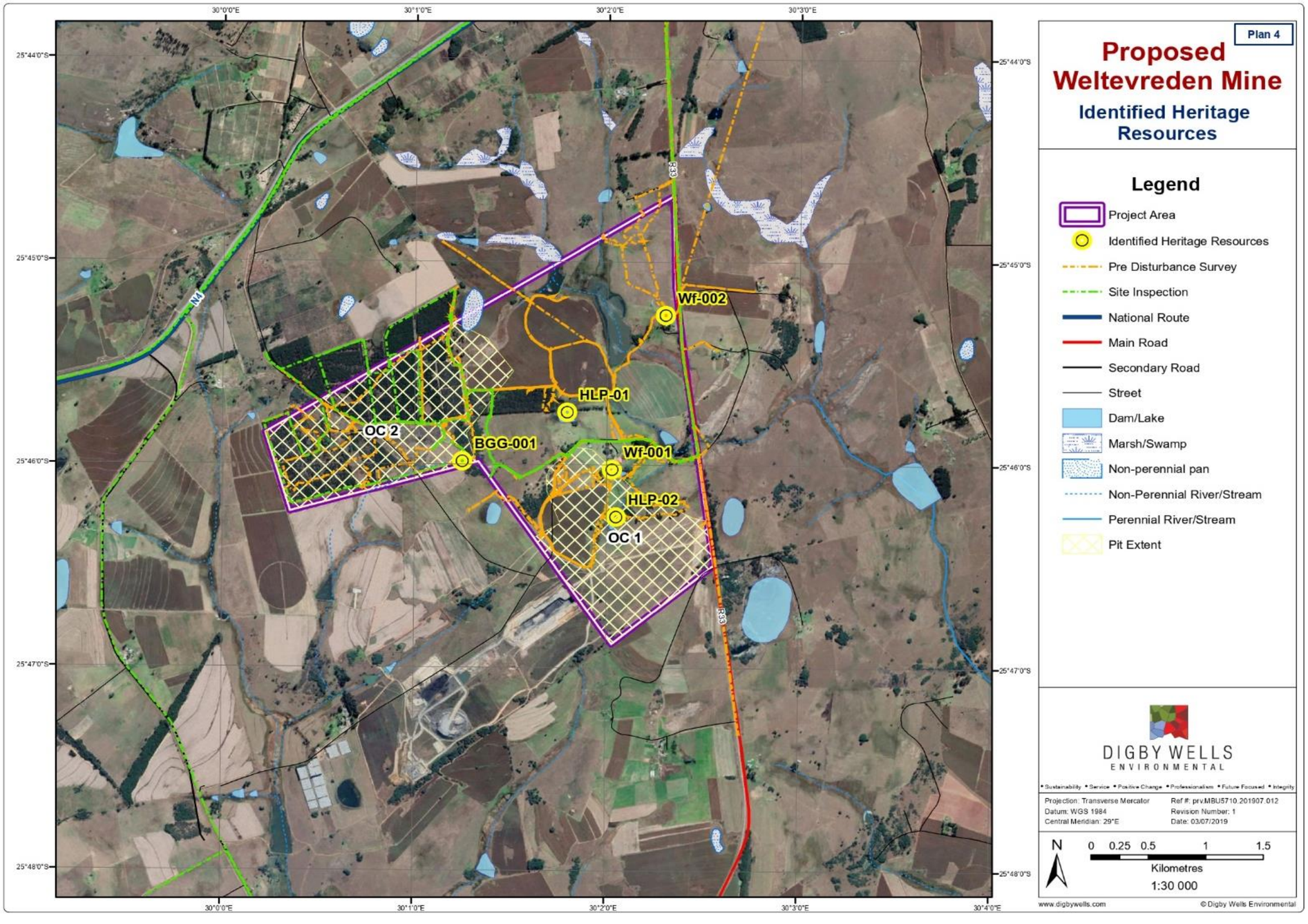


Figure 10-27: Results of the Pre-disturbance Survey

11 Item 2(h)(v): Impacts Identified

The methodology to identify, determine and assess the potential impacts is provided in this section and will be utilised by the relevant Specialists during the EIA Phase.

11.1 Item 2(h)(vi): Methodology Used in Determining the Significance of the Environmental Impacts

To clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of EIA practitioners, propose a numerical methodology for impact assessments, one has to accept that the process of environmental significance determination is inherently subjective.

The weight assigned to each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&AP's and authorities who provide input into the process.

The perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

The purpose of the EIA process is to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context.

11.1.1 Impact Rating

The impact assessment methodology utilised during the EIA Phase for the Project consists of two phases namely impact identification and impact significance rating.

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts have been identified, a numerical environmental significance rating process will be undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental impact.

The severity of an impact is determined by taking the spatial extent, the duration and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures were incorporated into the EMP.

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:

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

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 11-2. 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 has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 11-3).

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 11-1: Impact Assessment Parameter Ratings

Rating	Intensity/Replacability		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 definitely 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/Replacability		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/Replacability		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.	Local 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/Replacability		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 as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/Replacability		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 11-2: Probability / Consequence Matrix

Significance																																						
-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
-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
-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
-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
-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
-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
-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 11-3: 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) (-)
-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) (-)

11.2 Item 2(h)(vii): 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

Negative impacts preliminarily identified in this report will mostly be associated with negative effects of open cast coal mining and the biophysical environment. As mentioned, the site is characterised by several wetland systems which host species dependent on this system and

the most significant negative impacts are expected to be on these systems and the fauna and flora established there. Farming practices have altered the natural terrain of the area but have maintained some natural features to which fauna and flora have adapted. The negative affect in terms of socio-economic and cultural heritage impacts include probable job losses for farm employees currently residing within the proposed Mining Right Area, as well as potential relocation of graves.

Positive impacts associated with the Project are mostly socio-economic impacts. The implementation of the SLP will assist the Province and District Municipality in realising community upliftment projects for communities surrounding the proposed mine. Potential biophysical positive impacts will be less significant and mostly realised during closure and rehabilitation of the mine.

11.3 Item 2(h)(viii): The Possible Mitigation Measures that could be Applied and the Level of Risk

Possible mitigation measures that could be applied to risks regarding the site layout will be considered in detail as part of the EIA Phase. The infrastructure layout plan has been designed to limit, prevent and avoid potential environmental and social impacts. The layout plan will also take into consideration the comments received form I&APs once the Public Participation Process has been initiated as well as the findings of the specialist investigations as part of the EIA Phase. The preliminary mitigation types for the assumed risks (to be confirmed during the EIA Phase) are also listed in 12.2 below.

11.4 Item 2(h)(ix): The Outcome of the Site Selection Matrix and Final Layout Plan

The preliminary layout for this application process has been predominantly determined by the position of the economically mineable coal resource as well as the sensitivity analysis conducted in the pre-application phase. Sensitivity buffers, including legislated wetland buffers and blast radius buffers were delineated and applied.

11.5 Item 2(h)(x): Motivation Where No Alternatives Sites were Considered

The location of the Project is determined by the location of the economically viable coal resource. Therefore; alternatives in terms of infrastructure placement were considered in the pre-application phase and informed by the sensitivity map compiled prior to the Project Description being finalised.

11.6 Item 2(h)(xi): Statement Motivating the Preferred Site

The preliminary layout for this application process has been predominantly determined by the position of the economically mineable coal resource as well as the sensitivity analysis

conducted in the pre-application phase. Sensitivity buffers, including legislated wetland buffers and blast radius buffers were delineated.

12 Item 2(i): Plan of Study for the Environmental Impact Assessment Process

The purpose of the EIA phase will be to investigate the potential negative and positive impacts of a proposed project activity on the environment. The potential impacts will then be quantified to assess the significance that an impact may pose on the receiving environment. The objectives of the EIA process are to:

- Ensure that the potential biophysical and socio-economic impacts of the proposed Project, including those as a result of blasting and potential traffic impacts, are taken into consideration during the decision-making process;
- Ensure that the Project activities undertaken do not have a substantial detrimental impact on the environment by presenting management and mitigation measures that will avoid and/or to reduce those impacts;
- Ensure that I&APs are informed about the proposed Project and the PPP to be followed;
- Ensure that I&APs are given an opportunity to raise concerns; and
- Provide a process aimed at enabling authorities to make an informed decision, especially in respect of their obligation to take environmental and social considerations into account when making those decisions.

The purpose of this Plan of Study is to explain the approach that will be followed in undertaking the EIA and EMP Compilation. Appendix 2 of the EIA Regulations, Section 2(1)(h) prescribes the required contents of the Plan of Study as follows:

(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including−

i. a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;
ii. a description of the aspects to be assessed as part of the environmental impact assessment process;
iii. aspects to be assessed by specialists;
iv. a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists;
v. a description of the proposed method of assessing duration and significance;
vi. an indication of the stages at which the competent authority will be consulted;
vii. particulars of the public participation process that will be conducted during the environmental impact assessment process;

viii. a description of the tasks that will be undertaken as part of the environmental impact assessment process; and

ix. identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored (section 12.2).

A summary of the proposed Plan of Study for the EIA Phase is contained in Table 12-1, based on the EIA Regulations, 2014 (as amended).

Table 12-1: Plan of Study

Requirement	Response
Alternatives to be assessed in the EIA Phase.	The EIA will include further detailed assessment of site layout alternatives based on environmental sensitivities identified through the specialist studies.
Aspects to be assessed as part of the EIA.	The EIA Phase will assess the overall aspects affected by the proposed project in relation to Listed and non-listed project activities. The potential impacts of the preferred alternative will be assessed in the EIA phase in terms of the following aspects: ▪ Soils, Land Use and Land Capability; ▪ Air Quality, Noise and Visual; ▪ Surface- and Groundwater; ▪ Aquatic Biodiversity; ▪ Fauna & Flora; ▪ Wetlands; ▪ Heritage resources; ▪ The socioeconomic environment; ▪ Traffic Impact Assessment; and ▪ Blasting and Vibration Impact Assessment.
Aspects to be assessed by specialists in the EIA Phase (Specialist methodologies for the EIA Phase are discussed in Section 12.1, below)	The following specialist studies will be undertaken: ▪ Surface Water Impact Assessment; ▪ Groundwater Impact Assessment; ▪ Soil, Land Use, Land Capability, and Impact Assessment; ▪ Fauna and Flora Impact Assessment; Wetlands Impact Assessment; ▪ Aquatic Ecology Impact Assessment; ▪ Air Quality Impact Assessment; ▪ Noise Impact Assessment; ▪ Heritage resources; ▪ The socio-economic environment; ▪ Traffic Impact Assessment; and

Requirement	Response
	▪ Blasting and Vibration Impact Assessment. In addition, a Financial Provision and Closure Liability Assessment, as well as a Rehabilitation Plan, will be included in the EIA.
Method of Assessing Impacts (including duration and significance)	Please refer to Section 11.1 of this Report for the proposed Impact Assessment Methodology.
An indication of the stages at which the competent authority will be consulted	DMR will be consulted as follows: ▪ Pre-Application consultation meeting; ▪ Provided a copy of the Draft Scoping Report for comment; ▪ Submit a copy of Final Scoping Report for consideration. ▪ Provided a copy of the Draft EIA Report for comment; and ▪ Submit a copy of the Final EIA Report for consideration.
Public Participation	An I&AP database has been compiled but will be continuously updated during the course of the Project. I&APs will be invited to comment on this Draft Scoping Report for a 30-day period. Comments received will be consolidated in a Comments and Response Report (CRR) and included in the updated Scoping Report. Similar to this Scoping Phase, I&APs will also be provided an opportunity to comment on the Draft EIA Report in due course. It is further proposed that Public Meetings be held during the Scoping and EIA Phases to ensure effective communication with stakeholders.
Tasks that will be undertaken during the environmental impact assessment process	The following tasks will be undertaken during the EIA phase: ▪ Further define the project activities; ▪ Further assess the project alternatives based on technical, economic, social and environmental criteria; ▪ Undertake detailed (updated) specialist investigations; ▪ Confirm services requirements (water, electricity, sewage etc.); ▪ Assess potential impacts using the methodology provided herein; ▪ Provide detailed and feasible mitigation and management measures in an EMP; and ▪ Public participation activities, including public and key stakeholder meetings.

12.1 Specialist Methodologies for the EIA Phase

The subsections below provide detail for the specialist studies included.

12.1.1 Surface Water

12.1.1.1 Water Quality

Water quality results for samples collected during the site visit undertaken on 10 May 2019 will be assessed, interpreted and presented in various comprehensive formats. This will be useful for monitoring to identify any changes to water quality that might result from mining activities at the Weltevreden project site.

12.1.1.2 Floodline Determination

The 1:50-year and 1:100-year floodlines will be determined for streams in proximity to and within the project boundary. Floodlines modelling will include the following tasks:

- Calculation of the 1:50-year and 1:100-year peak flows for the affected rivers;
- Pre-processing or model setting up in RAS Mapper within the HEC-RAS 5.05 programme;
- Hydraulic analysis in HEC-RAS 5.05 to determine the 1:50 and1:100 floodlines; and
- Post-processing and mapping of modelled floodlines in ArcGIS.

It must be noted that the study will determine indicative floodlines, which can only be used for environmental purposes and not for detailed engineering designs.

12.1.1.3 Stormwater Management plan

A Storm Water Management Plan (SWMP) will be developed to ensure the separation of clean and dirty water within a mining environment, and to develop an effective and efficient water management plan. The following tasks will need to be completed:

- Delineation of clean and dirty water catchments;
- Calculation of peak flows for clean and dirty water catchments; and
- Conceptual placement of stormwater infrastructure will be indicated on the plan

12.1.1.4 Water Balance

Review of the proposed water management plan will be undertaken to understand the entire water reticulation system, explaining its drivers and controls. This will include:

- Water flow linkages and volumes;
- Rainfall and runoff volumes for affected catchments and open facilities;
- Capacities of water storage facilities; and
- Developing Microsoft Excel based average annual, monthly and daily water balances indicating the inflows, outflows, potential losses and transfers within the system.

12.1.2 Groundwater

The following methodology is proposed for the EIA phase of this project:

- Carry out a ground geophysical survey to delineate weathered zones and geological structures underlying the proposed project area and identify drill targets;
- Rotary Air Percussion drilling of four boreholes is recommended to assess the underlying geological horizons and its associated groundwater bearing (aquifer) properties;
- Aquifer testing to determine aquifer parameters;
- A hydrogeological sensitivity analysis to guide placement of the discard dump, processing plant and Pollution Control Dam (PCD);
- A geochemical assessment to evaluate the coal seam material and waste for acid generating capacity; and
- Numerical model building and scenario modelling of identified groundwater impacts and mining activities (dewatering).

12.1.3 Soils

The plan of study for the soils aspect will include the scope of work as provided below.

12.1.3.1 Aerial Imagery Analysis and Literature Review

Aerial imagery will be analysed to determine areas that are most likely to be suitable for agriculture. The aerial imagery analysis will focus on lower lying areas where suitable soils are more likely to occur. As part of the assessment, baseline soil information will be obtained from the South African land type data published with maps at a scale of 1:250 000 by the Institute for Soil, Climate and Water (ISCW) of the Agricultural Research Council (ARC).

12.1.3.2 Soil Survey

Soil will be augered to the first restricting layer or 1.5 m depth. Mapping unit boundaries will be determined by changes in topography with subsidiary indications from vegetation and parent material.

Site properties (vegetation and position on the landscape) and soil properties will be recorded at each mapping point. The soil forms found will be identified using the South African Soil Classification System namely; Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018). The site visit will also be used to gain a better understanding of the current conditions.

12.1.3.3 Soil Sampling and Analysis

Laboratory data will provide support for recommendations and decisions made from a soil survey, regarding soil and rehabilitation management. Representative soil samples will be taken at each of the predetermined focus areas. Samples will be taken from 0 – 0.6 m depth.

Fertility analysis will provide recommendations for fertilisation and liming that is mostly used for soil management.

12.1.3.4 Land Suitability

The process of land suitability classification is the grouping of specific areas of land in terms of their suitability for a defined land use. Soils will be classified for land suitability based on soil form, depth and drainage. Depending on which of these are limiting, the soils will be classified either Class S1, Class S2, Class S3, Class N1, or Class N2. The information from the land capability assessment and soil analysis will form part of the final agricultural potential report.

12.1.3.5 Land Capability

Land capability will be determined by assessing a combination of soil, terrain and climatic features, as well as observations during the site survey. The land will be rated into eight classes which include group of capability units or subgroups that have the same relative degree of limitation or potential.

12.1.4 Wetlands

The HGM Unit system of classification focuses on the hydro-geomorphic setting of wetlands which incorporates geomorphology; water movement into, through and out of the wetland; and landscape / topographic setting. Once wetlands have been identified, they are categorised into HGM Units as shown in Table 12-2. This study will also consider soil form indicators, soil wetness, vegetation, ecological health, and ecological importance and sensitivity.

Table 12-2: Description of the Various HGM Units for Wetland Classification

Hydromorphic wetland type	Diagram	Description
Floodplain		Valley bottom areas with a well-defined stream channel stream channel, gently sloped and characterised by floodplain features such as oxbow depression and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom with a channel		Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from the main channel (when channel banks overspill) and from adjacent slopes.

Hydromorphic wetland type	Diagram	Description
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel usually gently sloped and characterised by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from the channel entering the wetland and also from adjacent slopes.
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterised by colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.
Isolated hillslope seepage		Slopes on hillsides that are characterised by colluvial transport (transported by gravity) movement of materials. Water inputs are from sub-surface flow and outflow either very limited or through diffuse sub-surface flow but with no direct link to a surface water channel.
Pan/Depression		A basin-shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. It is inward draining). It may also receive subsurface water. An outlet is usually absent and so this type of wetland is usually isolated from the stream network.

12.1.5 Aquatics

The following sections describe the methodology that was adopted during the aquatic (instream) ecology field assessment.

To enable an adequate description and the determination of the Present Ecological State (or Ecological Category) associated with the surrounding watercourses, it was envisaged that the following indicators be evaluated as part of the study:

- Stressor Indicators:
  - In situ water quality (Temperature, pH, Electrical Conductivity, and Dissolved Oxygen);
- Habitat Indicators:
  - Adapted Invertebrate Habitat Assessment System (IHAS, Version 2.2).
- Response Indicators:
  - Aquatic macroinvertebrates with the use of the South African Scoring System (SASS, Version 5) rapid bio-assessment protocol and the Macro-Invertebrate Response Assessment Index (MIRAI, Version 2).

This study will also incorporate water quality parameters, Invertebrate Habitat Assessment System (IHAS), Version 2.2, and the Macroinvertebrate Response Assessment Index (MIRAI).

12.1.6 Fauna and Flora

A terrestrial Fauna and Flora Impact Assessment report will be compiled and will include the findings of the vegetation survey and fauna survey as detailed in the methodology section below. Potential impacts on terrestrial biodiversity will be identified and the significance of these impacts assessed in order to determine suitable mitigation measures that can be included in an Environmental Management Plan (EMP) for the Weltevreden project.

12.1.6.1 Objectives of the Study

This specialist study serves to undertake a basic ecological assessment of the local flora and fauna communities associated with the Weltevreden project site and associated infrastructure to determine the current state of these components. Information generated from this survey will be been used to address the impacts that the construction, operational and decommissioning activities will have on this environment. To achieve this aim the following objectives were considered:

- To delineate the various vegetation/habitat types and describe their sensitivity, present within the study area;
- To determine if any flora and fauna species or assemblages will be directly impacted upon by the proposed mining activities and its associated infrastructure. This includes flora and fauna communities present, the state of these communities and the identification of possible Red Data species in accordance with the IUCN, National and Provincial criteria; and
- To undertake an assessment of the impacts associated with various activities on the health of the flora and fauna species or assemblages; and to recommend measures that should be included in the EMP to prevent or limit impacts to flora and fauna species or assemblages.

12.1.6.2 Methodology for Fauna and Flora Impact Assessment

12.1.6.2.1 Literature review and desktop study

A desktop study was undertaken, aiming to identify:

- Potential species in the Project area according to the South African National Biodiversity Institute (SANBI);
- Potential Red Data species (Flora and Fauna) and their current National and International status;
- Expected vegetation type and community structure, (Low & Rebelo, and Mucina & Rutherford 2012); and

- Current Biodiversity and Ecosystem Status (Gauteng C-Plan).

12.1.6.3 Flora and Vegetation Analysis

Vegetation analysis will consider samples taken from predetermined sampling plots based on desktop research of the various vegetation type classifications. Vegetation communities will be defined using the data gathered from each sample plot. Vegetation will be mapped using the information gathered from the sample plots and resultant vegetation communities, as well as aerial imagery. Through the sample plots, several aspects of the flora will be identified. These included the Species list, a list of Species of Special Concern, and the list of alien and invasive species.

The species list is compiled from the sample plots. All species occurring in each sample plot will be identified where possible, either during the site visit or afterwards from photographs.

A species list representative of the entire study area of species seen within the study area, but not within specific sample plots were also recorded.

From the overall species list, a list of SSC is compiled. To ensure that a comprehensive list is developed it will include plants on each of the following lists:

- SANBI Red List of South African plants version 2015.1;
- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) listed species; and
- National Forests Act, 1998 (Act No. 84 of 1998) Protected Trees.

The South African red data list uses the same criteria as that defined by the IUCN. According to the IUCN all species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation (IUCN, 2010).

12.1.6.4 Fauna

Pertinent notes will be made during the survey and desktop studies will also be conducted for mammals, birds, reptiles and frogs. All faunal species encountered on site will be identified and recorded. The survey will attempt to identify mammals, avifauna (birds), reptiles and frog species, and include a Red Data faunal assessment.

Following the field survey and vegetation classification, vegetation sensitivity analysis will be quantified by subjectively assessing two factors, namely ecological function and conservation importance.

Ecological health is an indication of carrying capacity of an ecosystem and therefore its ability to perform ecological services.

To adequately gauge the ecological health of the study site it is important to give a qualitative definition of the ‘perceived biodiversity value’ of the land. This is done at a broad level, to simply categorise the total area of land owned based on potential biodiversity value.

Biodiversity Value is understood as being a combination of the conservation status and the functional status of the area.

Functional Status refers to an indication of the services provided by an area and includes both ecological and human related services. Functional Status depends on the degree to which the area or system still provides a noticeable service (Figure 12-1).

Conservation Status depends on:

- The amount of the area or system remaining (the extent);
- The diversity in terms of Proportional species composition of the area of system, and the presence of ecosystems/habitat and species which are endemic, threatened, vulnerable or have particularly high religious/cultural value; and
- The degree to which the area or system reflects/represents its original state.

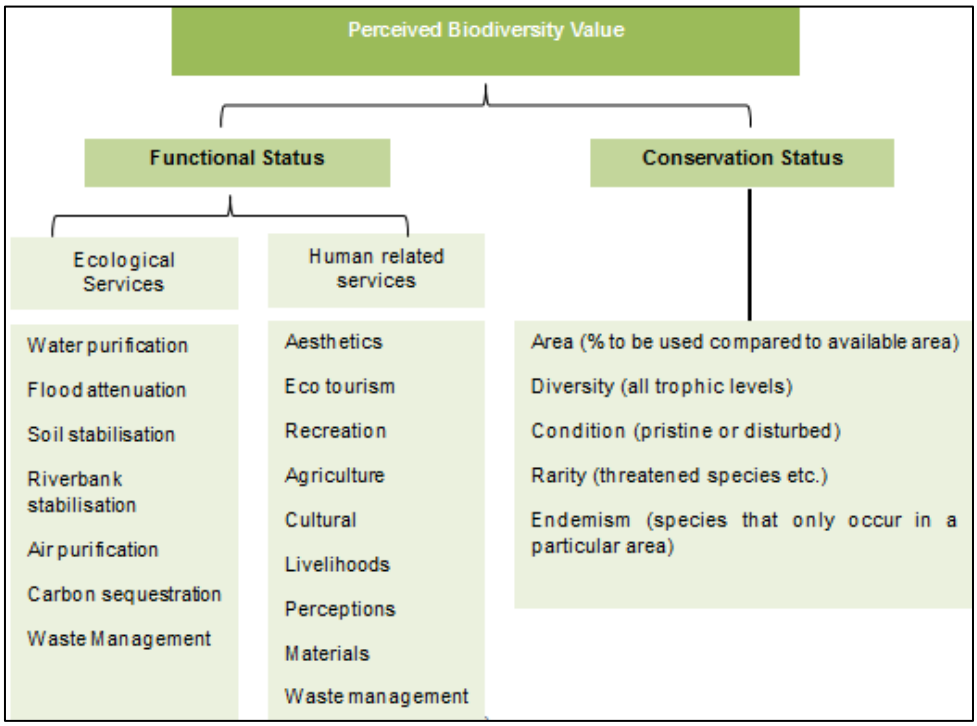


Figure 12-1: Perceived Biodiversity Value (Coombes, 2004)

The final decision on the biodiversity value of an area depends on the combination of the functional and conservation status. In assessing the biodiversity value of the area various literature and data is referenced such as:

- International Union of the Conservation of Nature;
- The National Protected Areas Expansion Strategy;
- The National Vegetation Map (Mucina and Rutherford, 2006);
- The Gauteng C-Plan;

- The National List of Ecosystems that are Threatened and in need of Protection; and
- The National Spatial Biodiversity Assessment.

In addition, the data gathered from the field assessment allows for more fine-scale and accurate view of the vegetation in the study area. This data is pivotal for the determination of sensitivity of the area. Based on this approach the total land surface within the project area is categorised into the following biodiversity classes as listed in Table 12-3.

Table 12-3: Score Table Describing the Biodiversity Value Scores

Score	Biodiversity Value	Percentage Score
1	Very High Biodiversity Value	0 - 25%
2	High Biodiversity Value	25-50%
3	Moderate Biodiversity Value	50 – 75%
4	Low Biodiversity Value	75 – 100%

12.1.7 Air Quality

An Air Quality Impact Assessment (AQIA) will be undertaken to determine the impacts associated with the proposed construction and operation related mining activities. Pollutants quantified and evaluated in the assessment included dust fallout, fine particulate matter (PM_{10} and $PM_{2.5}$) as well as gaseous pollutants (SO_2, NO_2 and CO). The study will be undertaken according to various air quality legal framework and recommendations, which include: NEM:AQA and National Dust Control Regulation (2013).

12.1.7.1 Receptors

Receptor locations and distances from the project area are based on visual observation on Google Earth Imagery. Receptors are located to the southeast sections of the Project area. These include mainly some farms. The Project is situated within a region that is characterised by agricultural and mining activities.

12.1.7.2 Air quality impact assessment

The AQIA will include the emission inventory and the atmospheric dispersion modelling and results thereof.

Emissions generated from mining activities are often associated with fugitive dust emissions, such as: PM_{10}, $PM_{2.5}$ and dust fallout. Gaseous emissions such as SO_2, NO_2 and CO are mostly from generator sets and mine vehicle fleet used during the operational phase of mining. Emission factors published by the US-EPA in its AP-42 document “Compilation of Air Pollution Emission Factors (USEPA 1995: 1998) and Australian National Pollutant Inventory “Emission Estimation Technique (EET)” manuals (2012) will be used during the study. USA Environmental Protection Agency's Preferred/Recommended Models: AERMOD modelling

system (as of December 9, 2006, AERMOD) will be used for the atmospheric dispersion modelling to predict the ambient pollutants at the level ground.

12.1.8 Noise

The methodology to be included in the study will encompass the environmental noise baseline measurement on site, the calculation of future ambient noise levels and the impact assessment.

Baseline noise monitoring will be conducted at various noise sensitive receivers surrounding the proposed coal mining activities. The measurement and calculation procedures will be performed in compliance taken in accordance with SANS 10103, SANS 10328, SANS 10117 and SANS 10210.

All measurements will be taken for 24 hours per sampling point and results interpretation will be in accordance with the guidelines of the SANS 10103:2008. The South African National Standards (SANS) 10103:2008 “The measurement and rating of environmental noise with respect to annoyance and to speech communication” provide acceptable sound level limits for specific zones such as rural, urban or industrial districts. The details of typical rating levels for noise in the specified districts are given in Table 12-4. The measurements will include spectral analysis.

The baseline information will be included in an environmental noise impact assessment report, along with the quantification of the noise sources that will be produced by the proposed coal mining activities. The impacts of the proposed coal mining activities on the ambient noise levels of the area will be assessed by comparing the baseline information with the propagated noise levels from the proposed coal mining activities. The propagated noise levels will be calculated by means of the dispersion modelling software ‘Soundplan’. The report will also include recommended mitigation measures as well as recommended action plans.

Table 12-4: Acceptable Rating Levels for Noise in Districts (SANS 10103, 2008)

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]
RESIDENTIAL DISTRICTS						
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
NON-RESIDENTIAL DISTRICTS						

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]
d) Urban districts with some workshops, with business premises, and with main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50
NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.						
NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7						
NOTE 3 In districts where outdoor $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.						
NOTE 4 For industrial districts, the $L_{R,dn}$ concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.						
NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.						
NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.						
a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.						
b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.						

The probable community/group response to levels in excess of the acceptable rating levels are presented in Table 12-5, where LReq,T is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific time period. ‘A-weighted’ is a

standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Table 12-5: Categories of Community / Group Noise Response (SANS 10103, 2008)

Excess ($\Delta L_{Req,T}$)[a]dBA	Estimated community/group response	
	Category	Description
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 - 20	Strong	Threats of action
>15	Very strong	Vigorous action
NOTE Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.		
a $\Delta L_{Req,T}$ should be calculated from the appropriate of the following:		
1) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation);		
2) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		
3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.		

12.1.9 Socio-Economic

Primary data will be collected by conducting a maximum of four individual interviews or focus group discussions with key stakeholders, which may include members of settlements in the vicinity of the project, land-users and owners, a representative of the proponent and other mining operations surrounding the proposed project site, active unions or NGOs in the area, and ward councillors or local municipal representatives. The main aims of such consultations will be as follows:

- To assess stakeholders' perceptions, concerns and expectations regarding the project;
- To verify baseline socio-economic information collected through the desktop review;
- To identify potential impacts of the proposed project on people's lives and livelihoods; and
- To help identify possible mitigation measures to avoid or reduce negative impacts of the project.

Potential socio-economic impacts of the project will be identified through information obtained from interviews with key informants and/ or through specialist opinion. Each of the impacts will

be assessed in light of the baseline conditions in which they are likely to occur, and their significance will be rated using a recognised rating system.

Cost-effective and practical mitigation measures will be designed with the aim of avoiding or ameliorating negative social impacts and enhancing positive ones. In addition, the social assessment will make recommendations regarding potential linkages and synergies with relevant development planning at a local and regional level, and comment on the scope of potential resettlement (if any) and the most appropriate approach to such resettlement.

12.1.10 Cultural Heritage

Heritage resources do not exist in isolation to the greater natural and social environment, including the socio-cultural, socio-economic and socio-political environments. In addition, the NHRA requires the grading of heritage resources in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Digby Wells defined four nested study areas for the purposes of this study, which include:

- The *site-specific study area*: the farm portions extent associated with the proposed Project, including a 500 m buffer area. The site-specific study area may extend linearly, in which case the site-specific study area will include the linear development and a 200 m buffer on either side of the footprint;
- The *Prospecting Right area*: the farm portions included in the existing Prospecting Right held by Xivono.;
- The *local study area*: the area most likely to be influenced by any changes to heritage resources in the Project area or where Project development could cause heritage impacts. Defined as the area bounded by the local municipality, in this instance ELM, with particular reference to the immediate surrounding properties and/or farms. The local study area was specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provided the local development and planning context that may contribute to cumulative impacts; and
- The *regional study area*: the area bounded by the district municipality, which here is NDM. Where necessary, the regional study area may be extended outside the boundaries of the district municipality to include much wider regional expressions of specific types of heritage resources and historical events. The regional study area also provided the regional development and planning context that may contribute to cumulative impacts.

12.1.10.1 Statement of Cultural Significance and Field Ratings

The following sub-sections provide a summary of the methodology employed in the assessment of the CS of the identified heritage resources.

12.1.10.1.1 Cultural Significance

Cultural heritage resources are intrinsic to the history and beliefs of communities and characterise community identity and cultures. Heritage resources are finite, non-renewable and irreplaceable. HRM acknowledges that such resources have lasting worth as evidence of the origins of life, humanity and society. It is incumbent of the assessor to determine the CS of cultural heritage resources to allow for the implementation of appropriate management.

To this end, Digby Wells has developed a CS Determination Methodology to assign cultural heritage resources a numerical CS rating in the most objective manner possible and that, should it be required, could be independently reproduced by another specialist with the same information. Section 3(3) of the NHRA defines CS as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a cultural heritage resource. The Digby Wells significance matrix combines these attributes into four themes: aesthetic, historical, scientific and social.

Heritage resources are assigned an importance rating, along a six-point scale against four criteria, and a rating of the physical integrity, on a five-point scale. These ratings consider the information obtained during the review of secondary data, the uniqueness of a resource and the observed *status quo*.

12.1.10.1.2 Field Ratings

The grading of heritage resources is the responsibility of the HRAs. However, SAHRA requires heritage assessments include Field Ratings for identified heritage resources to comply with Section 38(8) of the NHRA. Section 7 of the NHRA provides for the system of grading heritage resources that form part of the national estate.

The field rating process is designed to provide numerical ratings of the identified heritage resources. These numerical ratings relate to the recommended grading of a heritage resource and distinguish between three categories. Field ratings guide decision-making in terms of the minimum required mitigation measures and the management responsibilities in terms of Section 8 of the NHRA.

12.1.10.2 Secondary Data Collection

Data collection assists in the development of a cultural heritage baseline profile of the study area under consideration. Qualitative data was collected to inform this HSR and was primarily obtained through secondary information sources, i.e. desktop literature review and historical layering.

A survey of diverse information repositories was made to identify appropriate relevant information sources. These sources were analysed for credibility and relevance. These credible, relevant sources were then critically reviewed. The objectives of the literature review include:

- Gaining an understanding of the cultural landscape within which the proposed Project is located; and

- Identify any potential fatal flaws, sensitive areas, current social complexities and issues and known or possible tangible heritage.

Repositories that were surveyed included the South African Heritage Resources Information System (SAHRIS), online/electronic journals and platforms and select internet sources. This HSR includes a summary and discussion of the most relevant findings. Table 12-6 lists the sources consulted in the literature review.

Table 12-6: Secondary Data Sources

Reviewed Secondary Data		
Databases		
Genealogical Society of South Africa (Google Earth Cemetery Initiative, 2011)	University of the Witwatersrand (Wits) database (Archaeological Site Database, 2010)	
SAHRIS Database	SAHRIS Palaeo-Sensitivity Map (SAHRA, 2017)	
SAHRIS Cases		
Case ID:102 Case ID: 13006	Case ID: 11829 Case ID: 6278	Case ID: 13002 Case ID: 5472
Cited Text		
Behrens & Swanepoel, 2008	Brodie, 2008	Clark, 1982
Deacon & Deacon, 1999	Delius, 2007	Delius & Cope, 2007
Delius, et al., 2014	Eastwood, et al., 2002	Esterhuysen & Smith, 2007
Huffman, 2007	Landau, 2010	Makhura, 2007
Mitchell, 2002	Mucina & Rutherford, 2010	Pistorious, 2008a, 2008b
Potgieter, 1955	Smith & Zubieta, 2007	Smith & Ouzman, 2004
Voortrekkers, 2014		

Table 12-7 below lists the sources of historical imagery. Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information Systems (GIS). The rationale behind historical layering is threefold, as it:

- Enables a virtual representation of changes in the land use of a particular area over time;
- Provides relative dates based on the presence or absence of visible features; and
- Identified potential locations where heritage resources may exist within an area.

Table 12-7: Aerial Imagery Considered

Aerial photographs						
Job no.	**Flight plan**	**Photo no.**	**Map ref.**	**Area**	**Date**	**Ref.**
352	1 of 1	2090 and 2092	2528	Belfast	1955	NGI

12.1.10.3 Primary Data Collection

Justin du Piesanie visited the Project area on 04 April 2019. Shannon Hardwick undertook a pre-disturbance survey of the Project area on 02 to 03 and 06 to 07 May 2019. This was a non-intrusive[6] pedestrian survey with the aim to:

- Visually record the current state of the cultural landscape; and
- Record a representative sample of the visible, tangible heritage resources present within the Project area and greater study area.

Identified heritage resources were recorded as waypoints using a handheld GPS device. The heritage resources were also recorded through written and photographic records.

12.1.10.4 Site Naming Convention

Heritage resources identified by Digby Wells during the field survey are prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period or feature code and site number follows (e.g. 11829/BGG-001). The site name may be shortened on plans or figures to the period/feature code and site number (e.g. BGG-001). Table 12-8 presents a list of the relevant period and feature codes.

Table 12-8: Feature and Period Codes Relevant to this HIA

Feature or Period Code	Reference
BGG	Burial Grounds and Graves
STE	Historical Structure
Wf	Werf
HLP	Historical Layering Point

Heritage resources identified through secondary data collection were prefixed by the relevant SAHRIS case or map identification number (*where applicable*) and the original site name as used by the author of that assessment (e.g. 102/Site 1).

[6] No samples were taken during the pre-disturbance survey.

12.1.11 Traffic

The Traffic Impact Assessment will be conducted by Aurecon South Africa (Pty) Ltd and will comprise of the following steps:

- Conduct a site visit to understand existing transport characteristics around the site. This will include visual observations of traffic and non-motorised transport flow and general road geometry and intersection layouts. Traffic surveys will also be commissioned at key intersections;
- Meet the Mpumalanga and South African National Roads Agency authorities to scope their respective requirements and discuss any existing transport, traffic, and spatial plans of the study area;
- Estimate trip generation of additional vehicle trips to be generated by the proposed mine;
- Conduct capacity analysis using SIDRA software, if necessary, and recommend road upgrades to mitigate any traffic impact caused by the proposed road diversion;
- Review site access strategy and proposed access layout and stacking space requirements,
- Assess NMT and public transport activity near the site and recommend any mitigation measure where necessary;
- Conduct an environmental sensitivity analysis of the potential impact of the proposed mine; and
- The analytical findings will be summarised in a report, including conceptual drawings of the proposed road upgrades.

12.1.12 Blasting

The Blasting and Vibrations Impact Assessment will be undertaken by Blast Management & Consulting and the plan of study for the EIA Phase will include a site visit and information review, modelling and reporting.

12.1.12.1 Modelling and Report

A detailed EIA study report will be prepared and presented using data captured and information provided. The following aspects will be considered and presented as different sections in a final report:

- Introduction, background information of the proposed site
- Mining operations and / or Blasting Operation Requirements
- Site specific aspects applicable: The following aspects are generally considered for projects in South Africa:
  - Ground vibration explanation, prediction, modelling and related impacts

- Air blast explanation, prediction, modelling and related impacts
- Fly-rock explanation, prediction, modelling and related impacts
- Noxious fumes Information

- Impact Evaluation, Mitigations and recommendations
- A structure profile that will indicate what is typical of the area. This is not a full photographic survey but will assist in making a proper evaluation of allowable ground vibration and air blast levels.

12.2 Item 2(i)(ix): Measures to Avoid, Reverse, Mitigate, or Manage Identified Impacts and to Determine the Extent of the Residual Risks that Need to be Managed and Monitored

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities for the purpose of meeting a project need. An impact can be positive or negative, and the same activity can lead to impacts that are perceived as positive by certain stakeholder groups, and negative by others.

Significance of an impact can be reduced (if the impact is negative) or enhanced (if the impact is positive) by the implementation of management or mitigation/enhancement measures. This is achieved through the following:

- Identify alternatives that could lead to the avoidance of the impact occurring at all;
- Implement measures to reduce/enhance the likelihood of an impact occurring by ensuring effective management; or
- Implement procedures that will ensure timely and effective measures in the event of an impact occurring.

A detailed impact assessment will be undertaken during the EIA Phase based on the finding of the specialist studies. The significance of an impact ultimately determines the level of mitigation required to reduce the impact significance to acceptable levels. An EMP will be compiled to accompany the EIA and will include detailed mitigation measures to address each identified impact.

Table 12-9 provides a preliminary identification of activities the proposed project will be associated with, the potential impacts, and associated possible mitigation and management measures. In accordance with the EIA Regulations stipulating the contents of a Scoping Report, this table identifies the following:

- The impacts and risks associated with various aspects of the proposed development, including the nature, significance, consequence, extent, duration and probability of such identified impacts;

- The degree to which these impacts can be reversed (by mitigation or lapse of time), may cause irreplaceable loss of resources and can be avoided, managed or mitigated;
- The positive and negative nature of impacts that the proposed activity will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; and
- Possible mitigation measures that could be applied and level of residual risk.

Table 12-9: Preliminary Impacts and Mitigation Measures

Activities	Potential impacts	Mitigation type	Potential for residual risk
Surface Water			
▪ Site preparation including vegetation clearance and excavations; ▪ Stockpiling of spoils and discard; ▪ Construction of facilities such as offices, ablutions, storerooms, workshops, storage dams, process plant, roads, pipelines, power lines and conveyors.	▪ Sedimentation and siltation of nearby watercourses; ▪ Reduction of stream flow regimes due to disturbance of headwater wetlands that feed adjacent streams/rivers contributing to base flow; ▪ Downstream water users (irrigation, livestock watering and domestic uses) will be negatively affected by reduced stream flows due to disturbed headwater wetlands.	▪ Limit clearance and soil disturbance to the development footprint; ▪ Stormwater control including installation of drains, berms, silt fences and storage structures; ▪ No mitigation measures are possible to correct the reduction of runoff in streams that are adjacent to disturbed headwater wetlands.	Low
Groundwater			
Potential project site contamination of groundwater due to hydrocarbon spillages and leaks from construction vehicles.	Small scale groundwater hydrocarbon contamination.	Frequent vehicle checks and repairs.	Low
Small-scale dewatering during the construction of box cuts.	Small scale impact on groundwater levels is expected if the box cut extends beneath the natural groundwater table.	If the groundwater level is intercepted the extent and depth of the box-cut should be as minimal as possible.	Medium
Reduction of groundwater reserves due to mine dewatering.	Lowering of surrounding groundwater levels, impacting on groundwater users and other receptors.	The mining area should be as small and as shallow as possible to minimise effects on surrounding groundwater levels. Life of mine should be as short as possible to minimise dewatering time. If it is proven that a third-party groundwater supply is affected by the mine dewatering an alternative supply should be provided.	High
Groundwater level drawdown.	Local cumulative impact on wetland systems and/or pans.	The mining area should be as small and as shallow as possible to minimise effects on surrounding groundwater levels, and potential cumulative impacts on (partially) groundwater fed systems, such as wetlands or pans.	High
Contamination of the groundwater as a result of seepage from the various stockpiles and PCDs.	Groundwater contamination and plume development.	Discard dumps, ROM pads and PCDs should preferably be lined to minimise contaminated seepage into the underlying aquifers. Monitoring of down-gradient groundwater quality should be carried out for the LoM.	Low
Contamination from workshops, washbay or waste collection areas.	Small-scale groundwater contamination.	Extents of these areas should be minimised, and proper management should be in place in case of any spills/leakages observed. Monitoring of down-gradient groundwater quality should be carried out for the LoM.	Low
Contamination of groundwater in the final mine void.	Groundwater contamination and plume development.	Monitoring down-gradient of the mining areas should be carried out.	Low
Soils			
▪ Site preparation including vegetation clearance and excavations. ▪ Stockpiling of spoils and discard; ▪ Construction of facilities such as offices, ablutions, storerooms, workshops, storage dams, process	Removal of vegetation and land clearing may result in dust generation and erosion. The movement of heavy machinery on soil surfaces causes compaction which reduces the vegetation's ability to grow and consequently facilitate erosion. Removal of soil layer will impact on the land capability and vegetation can no longer be supported. The land capability has already been impacted as a result of mining activities and therefore land use and land capability will remain in its current state.	▪ Only clear vegetation when and where necessary; ▪ Only remove topsoil when and where necessary; ▪ Only the designated access routes are to be used; ▪ If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; ▪ Ensure proper storm water management designs;	High

Activities	Potential impacts	Mitigation type	Potential for residual risk
plant, roads, pipelines, power lines and conveyors.		▪ No land capability mitigation measures are possible during this phase; and ▪ Effective monitoring and management of topsoil areas for compaction, erosion and compaction.	
Wetlands			
Site clearing, including the removal of vegetation and topsoil	▪ Habitat fragmentation; ▪ Spread of alien and invasive species; ▪ Soil disturbance and/or compaction; ▪ Increased incidence of erosion; ▪ Sedimentation from erosion; ▪ Potential water quality deterioration; and ▪ Disturbance to avifauna and other fauna utilising the freshwater resources thus resulting in an overall loss of biodiversity.	▪ Environmental Practitioner to be present during vegetation clearing to prevent unnecessary clearing of extensive areas not part of the direct footprint area. ▪ The edge of the non-directly impacted freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the construction phase. ▪ Freshwater resource monitoring must be carried out during the construction phase by a wetland and aquatic specialist to ensure no unnecessary impact to the freshwater resources occur; and if so that a solution is put in place as soon as possible. ▪ An alien and invasive plant species management programme must be implemented during the construction phase. ▪ Carry out the Storm Water Management Plan. This must be in operation prior to the construction phase and freshwater resources must be highlighted as sensitive receptors.	High
Construction of mine related infrastructure including roads.	▪ Fragmentation of the freshwater resources as a result of road crossings; ▪ Loss of freshwater resource habitat (soils and vegetation) due to both direct and indirect impacts; ▪ Potential loss of wetland ecosystems or part thereof; and ▪ Loss of ecological services at the local and catchment scale.	▪ The clean and dirty water separation systems must be some of the first infrastructures installed on site and care must be taken to ensure that contamination of the receiving environment as a result of the open pit mining activities is minimised as far as possible; ▪ Ensure a soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ Actively re-vegetate disturbed areas immediately after construction; ▪ Install vegetation covers on all topsoil stockpiles; ▪ Implement and maintain an alien vegetation management programme; ▪ If it is absolutely unavoidable that any of the wetland areas will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure no incision and canalisation of the wetland features takes place; ▪ Erosion berms should be installed on roadways and downstream of stockpiles and waste rock dumps to prevent gully formation and siltation of the freshwater resources. The following points should serve to guide the placement of erosion berms: ▪ Where the track has a slope of less than 2%, berms every 50m should be installed; ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed; ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; and ▪ Where the track has a slope greater than 15%, berms every 10m should be installed.	Low

Activities	Potential impacts	Mitigation type	Potential for residual risk
		▪ All erosion observed within the construction footprint should be remedied immediately and included as part of an ongoing rehabilitation plan; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled; ▪ The edge of the freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the construction phase. ▪ Allow only essential personnel within the buffer areas for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; ▪ At areas where road crossings have been designed, these roads should cross wetland or river features at the narrowest point and at a 90-degree angle with suitable drainage designed into the relevant bridge crossing; ▪ Wherever possible, restrict construction activities to the drier months to avoid sedimentation of the wetlands and the aquatic resources further downstream; ▪ No material will be dumped or stockpiled within any rivers, tributaries or drainage lines in the vicinity of the proposed footprint area. ▪ No vehicles or heavy machinery will be allowed to drive indiscriminately within any wetland areas and their associated buffer zones. All vehicles must remain on demarcated roads and within the construction footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fuelling must take place on a sealed surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills will be immediately cleaned up and treated accordingly; and ▪ Appropriate sanitary facilities must be provided for the duration of the construction activities and all waste must be removed to an appropriate waste facility.	
Construction of open pits in wetland and aquatic areas	▪ Loss of wetland habitat; ▪ Potential habitat fragmentation; ▪ Increased erosion potential; ▪ Potential impacts as a result of sedimentation; ▪ Loss of water supply; ▪ Impacts to natural flow regimes; ▪ Potential loss of water quality further downstream ▪ Loss of biodiversity; ▪ Alterations to natural river channels; and ▪ Alterations to water distribution and volume.	No mitigation potential for this activity	High

Activities	Potential impacts	Mitigation type	Potential for residual risk
Stripping topsoil and soft overburden; Loading, hauling and stockpiling	▪ Increased potential for erosion, sedimentation and deposition impacts; ▪ Loss of water quality; and ▪ Loss of habitat and biodiversity.	▪ Environmental Practitioner to be present during the operational phase to prevent unnecessary clearing of extensive areas not part of the direct footprint area. ▪ The edge of the non-directly impacted freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly 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; ▪ 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. ▪ Ensure a soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ All erosion noted within the operational footprint should be remedied immediately and included as part of an ongoing rehabilitation plan; ▪ Ensure that no incision and canalisation of the wetland features present takes place; ▪ Erosion berms should be installed on roadways and downstream of stockpiles and waste rock dumps to prevent gully formation and siltation of the freshwater resources. The following points should serve to guide the placement of erosion berms: ▪ Where the track has a slope of less than 2%, berms every 50m should be installed; ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed; ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; and ▪ Where the track has a slope greater than 15%, berms every 10m should be installed; ▪ Actively re-vegetate disturbed areas immediately after construction; ▪ Implement and maintain an alien vegetation management programme; ▪ Install vegetation covers on all topsoil stockpiles; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled; ▪ No material will be dumped or stockpiled within any rivers, tributaries or drainage lines; ▪ No vehicles or heavy machinery will 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; ▪ All vehicles must be regularly inspected for leaks;	High

Activities	Potential impacts	Mitigation type	Potential for residual risk
		▪ Re-fuelling must take place on a sealed surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills will be immediately cleaned up and treated accordingly; and ▪ Appropriate sanitary facilities must be provided for the duration of the operational phase and all waste must be removed to an appropriate waste facility.	

Use and maintenance of haul roads for the transportation of coal	▪ Fragmentation of the freshwater resources as a result of road crossings;
	▪ Contamination of freshwater resources;
	▪ Impacts to water quality as a result of spills;
	▪ Compaction of soils;
	▪ Loss of habitat and biodiversity;
	▪ Increased potential for sheet runoff from paved/cleared surfaces;
	▪ Increased potential for erosion.
		▪ Ensure that no incision and canalisation of the wetland features present takes place;
		▪ Erosion berms should be installed on roadways and downstream of stockpiles and waste rock dumps to prevent gully formation and siltation of the freshwater resources. The following points should serve to guide the placement of erosion berms:
		  ▪ Where the track has a slope of less than 2%, berms every 50m should be installed;
		  ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed;
		  ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; and
		  ▪ Where the track has a slope greater than 15%, berms every 10m should be installed;
		▪ All erosion observed within the operational footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
		▪ All soils compacted as a result of operational activities should be ripped/scarified (<300mm) and profiled;
		▪ The edge of the freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the construction phase.
		▪ Allow only essential personnel within the buffer areas for all freshwater features identified;
		▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel;
		▪ No vehicles or heavy machinery will be allowed to drive indiscriminately within any wetland areas and their associated buffer areas. All vehicles must remain on demarcated roads and within the operational footprint;
		▪ All vehicles must be regularly inspected for leaks;
		▪ Re-fuelling must take place on a sealed surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; and
		▪ All spills should be immediately cleaned up and treated accordingly.
			Low

Operational pit activities, including excavation and dewatering	▪ Erosion and sedimentation; ▪ Impacts to the water quality of the groundwater, local and downstream resources; ▪ Potential loss of water supply from adjacent soils; ▪ Surface water runoff, ultimately resulting in a loss of catchment yield;	▪ Ensure a soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ The edge of the non-directly impacted freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly demarcated in the field with wooden stakes painted white as no-go	High

Activities	Potential impacts	Mitigation type	Potential for residual risk
	▪ Dewatering activities are likely to result in the loss of water supply to the freshwater systems present and in turn, moisture stress to the surrounding riparian and wetland vegetation; ▪ Disturbed soils may give rise to the spread and proliferation of alien and invasive species	zones that will last for the duration of the operational phase. The pit areas should not extend into freshwater areas and buffer zones; ▪ Erosion berms should be installed downgradient of the pit areas to prevent gully formation and siltation of the freshwater resources. The following points should serve to guide the placement of erosion berms: ▪ Where the track has slope of less than 2%, berms every 50m should be installed; ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed; ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; and ▪ Where the track has slope greater than 15%, berms every 10m should be installed. ▪ Concurrent rehabilitation is recommended, and pit areas should be backfilled and suitably rehabilitated on an ongoing basis for the life of the proposed operation; ▪ Allow only essential personnel within the buffer areas for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No material will be dumped or stockpiled within any rivers, tributaries or drainage lines in the vicinity of the proposed pit footprint areas. ▪ No vehicles or heavy machinery will be allowed to drive indiscriminately within any wetland areas and their associated buffer zones. All vehicles must remain on demarcated roads and within the construction footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fuelling must take place on a sealed surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; and ▪ Appropriate sanitary facilities must be provided for the duration of the operational activities and all waste must be removed to an appropriate waste facility.	
Rehabilitation of site and dismantling of infrastructure	▪ Erosion onset; ▪ Sedimentation; and ▪ Establishment of alien plants.	▪ Wetland monitoring must be carried out during the decommissioning phase to ensure no unnecessary impact to wetlands takes place; ▪ The edge of the non-directly impacted freshwater resources, and at least a 100m buffer or 1:100 floodline buffer, should be clearly demarcated in the field with wooden stakes painted white as no-go zones that will last for the duration of the decommissioning phase;	Medium

Activities	Potential impacts	Mitigation type	Potential for residual risk
		▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ Actively re-vegetate disturbed areas immediately after decommissioning; ▪ Implement and maintain an alien vegetation management programme for the duration of the decommissioning phase and into closure; ▪ All soils compacted as a result of mining activities should be ripped/scarified (<300mm), profiled and re-seeded with indigenous vegetation; ▪ No material will be dumped within any rivers, tributaries or drainage lines; ▪ No vehicles or heavy machinery will 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 ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; and ▪ Appropriate sanitary facilities must be provided for the duration of the decommissioning phase and all waste must be removed to an appropriate waste facility.	

Rehabilitation, including spreading of soil, re-vegetation and profiling or contouring	▪ Improper infilling and profiling, resulting in the creation of preferential flow paths and thus increasing the potential for erosion;
	▪ Improper rehabilitation of compacted soils, resulting in poor vegetation cover; and
	▪ Increased potential for the spread and establishment of alien and invasive species.
		▪ Ensure no incision and canalisation of the wetland features takes place;
		▪ Erosion berms should be installed downstream of areas to be re-profiled and contoured to prevent gully formation and siltation of the freshwater resources. The following points should serve to guide the placement of erosion berms:
		  ○ Where the track has a slope of less than 2%, berms every 50m should be installed;
		  ○ Where the track slopes between 2% and 10%, berms every 25m should be installed;
		  ○ Where the track slopes between 10%-15%, berms every 20m should be installed; and
		  ○ Where the track has a slope greater than 15%, berms every 10m should be installed;
		▪ All erosion observed within the operational footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
		▪ All soils compacted as a result of operational activities should be ripped/scarified (<300mm) and profiled;
		▪ Active re-vegetation of exposed soils should take place to prevent the onset of erosion;
		▪ Implement and maintain an alien vegetation management programme for the duration of the rehabilitation phase and into closure;
		▪ No vehicles or heavy machinery will be allowed to drive indiscriminately within any wetland areas and their associated buffer areas. All vehicles must remain on demarcated roads and within the rehabilitation footprint;
			Low

Activities	Potential impacts	Mitigation type	Potential for residual risk
		▪ All vehicles will be regularly inspected for leaks; ▪ Re-fuelling must take place on a sealed surface area away from wetlands to prevent ingress of hydrocarbons into topsoil; and ▪ All spills should be immediately cleaned up and treated accordingly.	
Post-mining decant into freshwater resources	▪ Loss of habitat integrity and ecosystem services such as toxicant removal and water for human use; ▪ Loss of water quality to downstream freshwater resources; ▪ Loss of biodiversity and sensitive fauna and flora.	▪ If post-mining decant takes place within proximity to, or within wetland areas, this water should be treated prior to release into the environment. ▪ Passive water treatment options should be considered as a priority, as this is more sustainable for the post-closure scenario.	Medium
Flora and Fauna			
Site clearing, including the removal of topsoil and vegetation	▪ Removal of plants including grasses, forbs, shrubs and trees. ▪ Destruction of faunal Habitat ▪ Habitat Fragmentation	▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed area to the minimum and within designated areas only. Re-vegetate open areas to limit erosion. ▪ Avoid known areas of faunal and floral SSC. ▪ Avoid sensitive landscapes such as wetlands and ridges. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. **Maintain** topsoil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used	Medium
Air Quality			
Site clearing	Reduction in air quality due to dust generation	▪ The use of dust suppressants and binders on haul roads to reduce dust generation; ▪ Dust monitoring plan; ▪ Limit activity to non-windy days; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s); ▪ The drop heights when loading onto trucks and at tipping points should be minimised.	Low
Excavations		▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s); and ▪ Dust monitoring plan	Low
Blasting		Blasting control	Low
Crushing		▪ Use of water sprays; ▪ Enclosure of crushers; and ▪ Fitting of dust extraction system.	Low
Stockpiling		▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; and ▪ Routine maintenance of side walls of storage.	Medium

Activities	Potential impacts	Mitigation type	Potential for residual risk
Noise			
Site clearing Excavations, blasting,	Noise generation	▪ Noise control measures, activities to daylight hours; and ▪ Switch of vehicles and machinery not in use	Low
▪ Stockpiles, ▪ Loading, hauling and transport of materials	Noise generation	▪ Noise monitoring, ▪ Switch of vehicles and machinery not in use	Low
Roads	Noise generation	▪ Noise control measures, ▪ Switch of vehicles and machinery not in use	Low
Socio-Economic			
All Construction, Operations and Decommissioning activities	Employment	▪ Temporary and permanent work opportunities will be available. Construction and decommissioning are specialised skills and will require a specialist team to lead and carry out a large proportion of the work. Contractors will be encouraged to employ labour as far as possible from Ward 1 and 8. ▪ During operations, the employer should consider employing qualified individuals from the local municipal area, particularly from Ward 1 where there are more economically active individuals available for employment and in Siyathuthuka where the dependency levels appear high. ▪ Where contractors are employed during operations, there should be a minimum percentage of certain skill categories of workers who should be employed from ELM wards closest to the mine.	High
All Construction, Operations and Decommissioning activities	Skills development	Skills development amongst employees and community members will be detailed in the mine's Social Labour Plan.	HIgh
All Construction, Operations and Decommissioning activities	Community health and safety	▪ Planning of mine infrastructure and activities must consider the on-site community activity such as the presence of children, pedestrian routes and livestock grazing. ▪ A risk assessment must be done to prioritise controlling significant hazards.	Low
All Construction, Operations and Decommissioning activities	Change in sense of place	Two open pits are planned as well as surface infrastructure. Infrastructure and activities associated with the new mining Project will change the character of the landscape for residents and business owners on the site. This potential impact will be assessed during the impact assessment phase with inputs received during consultations with stakeholders currently living, working and operating businesses on the site. Mitigation measures will be proposed to reduce the level of the impact to acceptable levels	Low
Removal of rock (blasting) during operations	Cracking of walls of homes	It is assumed that the blasting expert will assess potential impacts and provide mitigation measures, for example, a blasting schedule will be shared with the potentially affected community well in advance.	High
Contract mine workforce will work and reside in the area. Impact mainly during construction phase but possible during	Potential for negative social interactions, with negative consequences for health (e.g. potential for further increase in HIV/AIDs prevalence rate) and behaviour (e.g. potential for increase in violence)	Employees must be required to abide by a code of conduct, including responsible interaction with local communities.	High

Activities	Potential impacts	Mitigation type	Potential for residual risk
operations if contractors must conduct mining operation activities,			
Cultural Heritage			
Surface or vegetation clearing ahead of construction	Damage to or destruction of heritage resources generally protected under Sections 34, 35 and 36 of the NHRA (i.e. historical structures, archaeological and fossiliferous material or burial grounds and graves respectively)	Amend the Project design to avoid potential impacts to heritage resources. Where avoidance is not possible, Xivono must implement measures to minimise the potential impacts Digby Wells will describe the mitigation measures following the assessment of the potential impacts to heritage resources.	Potential exposure of previously unidentified heritage resources. There is a risk that such heritage resources may be damaged or destroyed when exposed. Negative Record of Decision (RoD) and/or development restrictions issued by the Heritage Resources Authorities[7] (HRAs) in terms of Section 38(8) of the NHRA.
Excavation for construction of infrastructure and establishment of pits			
Construction of infrastructure outlined in	The establishment and operation of the OC pits may affect heritage resources afforded general protection under Sections 34, 35 and 36 of the NHRA (i.e. historical buildings, archaeological and palaeontological material and burial grounds and graves respectively)		
Open-cast Mining			

[7] In this instance, the HRAs include the the South African Heritage Resources Agency (SAHRA) and the Mpumalanga Provincial Heritage Resources Agency (MPHRA).

13 Item 2(l): Other Information Required by the Competent Authority

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998) the EIA report must include the:-

13.1 Impact on the Socio-Economic Conditions of any Directly Affected Person

The proposed area earmarked for mining is characterised by agricultural land and current farm employees may be become unemployed as a result of the Project. Due to the skills required for mining, it is unlikely that farm employees from the directly affected farm portions can be considered for employment on the mine.

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

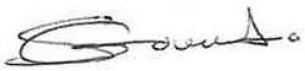
Graves and other heritage resources were identified during the Heritage pre-disturbance survey. Certain structures have been identified within the blast radius but the recommendations and requirements for mitigation measures or grave relocation will need to be determined in the EIA Phase.

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

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity. Refer to Section 9.1 for alternatives assessed. Refer to section 10.13 above for the cultural heritage baseline.

15 Undertaking Regarding Correctness of Information

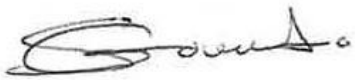
I, Sanusha Govender, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

Signature of the EAP: 

Date: 01 August 2019

16 Undertaking Regarding Level of Agreement

I, Sanusha Govender, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP: 

Date: 01 August 2019

17 References

Animal Demographic Unit (ADU) Virtual Museum database (http://vmus.adu.org.za). Accessed 22/02/2019.

Behrens, J. & Swanepoel, N., 2008. Historical archaeologies of southern Africa: precedents and prospects. In: N. Swanepoel, A. Esterhuysen & P. Bonner, eds. Five Hundred Years Rediscovered: South African precedents and prospects. Johannesburg: Wits University Press, pp. 23-39.

Brodie, N., 2008. The Joburg Book: A guide to the city's history, people and places. Johannesburg: Sharp Sharp Media.

Clark, J., 1982. The Cultures of the Middle Palaeolithic/Middle Stone Age. In: R. Oliver, ed. The Cambridge History of Africa. Cambridge: Cambridge University Press.

Convention on Biological Diversity (2002). List of Parties to the Convention on Biological Diversity. Available online at: http://www.biodiv.org/world/parties.asp

Deacon, H. & Deacon, J., 1999. Human Beginnings in South Africa. Johannesburg: David Phillip.

Delius, P., 2007. Mpumalanga: Reclaiming the Past, Defining the Future. Scottsville: University of KwaZulu-Natal Press.

Delius, P. & Cope, R., 2007. Hard-fought frontiers: 1845 - 1883. In: Mpumalanga: History and Heritage.. Pietermaritzburg: University of KwaZulu-Natal Press, pp. 137-199.

Delius, P., Maggs, T. & Schoeman, A., 2014. Forgotten World: The Stone-Walled Settlements of the Mpumalanga Escarpment. First ed. Johannesburg: Wits University Press.

Department of Environmental Affairs (DEA). (2011). National list of threatened ecosystems. General notice 1002 of 9 December 2011. Government Gazette No 34809.

Department of Environmental Affairs. (2014). Environmental impact assessment and management strategy for South Africa (Draft).

Driver A, Sink KJ, Nel JN, Holness S, Van Niekerk L, Daniels F, Jonas Z, Majiedt PA, Harris L, Maze K.(2012). National biodiversity assessment 2011: an assessment of South Africa's biodiversity and ecosystems. Synthesis report. Pretoria: South African National Biodiversity Institute and Department of Environmental Affairs.

DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa ISBN: 978-0-9802694-4-4

Eastwood, E., van Schalkwyk, J & Smith, B., 2002. Archaeological and rock art survey of the Makgabeng Plateau, Limpopo Basin. The Digging Stick, 19(1), pp. 1-3.

Esterhuysen, A. & Smith, J., 2007. Stories in Stone. In: P. Delius, ed. Mpumalanga: History and Heritage: reclaiming the past, defining the future. Pietermatiztburg: University of KwaZulu-Natal Press, pp. 41-67.

Ferrar, A. A., & Lötter, M. C. (2007). Mpumalanga biodiversity conservation plan handbook. Mpumalanga Tourism & Parks Agency, Nelspruit.

Fryrear, D.W., Stout, J.E., Hagen, L.J. and Vories, E.D., 1991. Wind erosion: field measurement and analysis. Transactions of the ASAE, 34(1), pp.155-0160.

Huffman, T., 2007. Handbook to the Iron Age: the archaeology of Pre-colonial Farming Societies in Southern Africa. Pietermaritzburg: University of KwaZulu-Natal Press.

Hodgson, F.D.I. and Krantz, RM, (1998). Groundwater Quality Deterioration in the Olifants River Catchment above the Loskop Dam with Specialised Investigations in the Witbank Dam Sub-catchment. WRC Report No.29/1/98

Hodgson, F.D.I., Krantz, R.M., (1995). Investigation into groundwater quality deterioration in the Olifants River catchment above the Loskop Dam with specialized investigation in the Witbank Dam sub-catchment. Institute for Groundwater Studies, University of the Orange Free State. WRC Report No. 291/1/95

IUCN (2012): IUCN Red List of Threatened Species, Version 2012.2: www.iucnredlist.org

Johnson, M.R., Van Vuuren, C.J., Hegenberger, w.F., Key, R.M. & Shoko, U. (1996). Stratigraphy of the Karoo Supergroup: an overview. 1. Afr. Earth Sci., 23, 3-15.

Landau, P. S., 2010. Popular Politics in the History of South Africa, 1400-1948. Cambridge: Cambridge University Press.

Malherbe, F le R. 2002. Noise Study for the Proposed Klipfontein Mining Project. Report No 02/2/1B.

Makhura, T., 2007. Early Inhabitants. In: Mpumalanga: History and Heritage.. Pietermaritzburg: The University of KwaZulu-Natal Press, pp. 91-135.

Mitchell, P., 2002. The Archaeology of Southern Africa. Cambridge: Cambridge University Press.

National Environmental Management: Air Quality Act (Act.39 of 2004) National Ambient Air Quality Standard for Pollutants, 2009.

National Dust Control Regulation 2013: “Dust fallout Standards”

New Plants of Southern Africa (NEWPOSA). http://newposa.sanbi.org. Accessed 22/02/2019.

Mucina, L. and M. Rutherford. Eds. (2012) update. Vegetation map of South Africa, Lesotho, and Swaziland. Strelitzia 19.

Pistorious, J., 2008a. Phase 1 Heritage Impact Assessment (HIA) Study for the Total Coal South Africa's (TCSA) Proposed New Expansion of the Dorsfontein Coal Mine (DCM) near Kriel on the Eastern Highveld in the Mpumalanga Province of South Africa,, Pretoria: Unpublished report prepared for Total Coal Ground Water Consulting Services.

Pistorius, J., 2008b. Phase 1 Heritage Impact Assessment (HIA) Study for Sasols proposed new shaft complex on Strybult 542 and for the North Block on the Eastern Highveld in the Mpumalanga Province of South Africa,, Pretoria: Unpublished Report prepared for Clean Stream Environmental and Sasol Secunda.

Potgieter, E., 1955. The disappearing Bushmen of Lake Chrissie: a preliminary survey. Pretoria: Van Schaik.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B., Cowling, R.M., Mucina, L. and Rutherford, M.C. (2004). South African National Spatial Biodiversity Assessment 2004. Technical report. Volume 1: Terrestrial component.

Rutherford, M. C., & Westfall, R. H. (1994). Biomes of southern Africa: an objective categorization. National Botanical Institute.

SACS (South African Committee for Stratigraphy) (1980). Stratigraphy of South Africa, Part 1 (Kent, L. E. Comp.). Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia, and the Republics of Bophuthatswana, Transkei and Venda. Handbk. geol. Surv. s. Ali: 8, 690.

SANBI BGIS - National Spatial Biodiversity Assessment. Accessed 22/02/2019.

SANS 10103: 2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication', Edition 6.

Schulze, R. E. (2006). Some foci of integrated water resources management in the "South" which are oft-forgotten by the "North": a perspective from southern Africa. In Integrated Assessment of Water Resources and Global Change (pp. 269-294). Springer, Dordrecht.

Smith, B. W. & Ouzman, S., 2004. Taking Stock: identifying Khoekhoen Herder Rock Art in Southern Africa. Current Anthropology, 45(4), pp. 499-526.

Smith, B. & Zubieta, L., 2007. The Power of Ancient Art. In: P. Delius, ed. Mpumalanga: History and Heritage. Pietermaritzburg: University of KwaZulu-Natal Press, pp. 69-90.

Tyson, P.D., Kruger, F.J and Louw, C.W., 1988: Atmospheric pollution and its implications in the Eastern Transvaal Highveld, South African National Scientific Programmes, Report, 150, Foundation for Research and Development, Pretoria.

Tyson P.D and Preston-Whyte R. A.2000. The weather and Climate of Southern Africa. Oxford University Press Southern Africa, Cape Town.

Australian National Pollutant Inventory Emission Estimation Technique Manual: Mining, Department of Sustainable, Environment, Water, population and Communities, 2012.

USEPA, Compilation of Air Pollution Emission Factors (AP-42), 6th Edition, Volume 1, as contained in the AirCHIEF (AIR Clearinghouse for Inventories and Emission Factors) CD-ROM (compact disk read only memory), US Environmental Protection Agency, Research Triangle Park, North Carolina, 1995.

South African Air Quality information System – SAAQIS. 2019, Ambient Monitoring. Available at http://saaqis.environment.gov.za/Report. Accessed on 21/06/2019.

Voortrekkers, T., 2014. The Great Trek - South Africa 1835 - 1845.. [Online] Available at: http://www.voortrekker-history.co.za/index.php#.VOBq3a8cTIU [Accessed 25 October 2017].

Walker, N. J., & Schulze, R. E. (2006). An assessment of sustainable maize production under different management and climate scenarios for smallholder agro-ecosystems in KwaZulu-Natal, South Africa. Physics and Chemistry of the Earth, Parts A/B/C, 31(15-16), 995-1002.

Weather base , 2019. Belfast weather. Available at https://www.weatherbase.com/weather/weatherall.php3?s=604873&cityname=Belfast%2C+Mpumalanga%2C+South+Africa&units. Accessed on 19/06/2019.

Woodford, A.C., and Chevallier, L., 2002. Hydrogeology of the Main Karoo Basin: Current Knowledge and Future Research Needs, WRC Report No. TT 179/02.

Appendix 1: EAP CV and Qualifications

Appendix 2: Plans