

DIGBY WELLS
ENVIRONMENTAL



Environmental Authorisations, IWULA and Mining Right Application for the proposed Weltevreden Mine, Mpumalanga

Heritage Impact Assessment

Project Number:

MBU5710

Prepared for:

Mbuyelo Group (Pty) Ltd

October 2019

Digby Wells and Associates (South Africa) (Pty) Ltd
Co. Reg. No. 2010/008577/07. Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191. Private Bag
X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 069 6801, info@digbywells.com, www.digbywells.com

Directors: GE Trusler (C.E.O), LF Stevens, J Leaver (Chairman)*, NA Mehlomakulu*, DJ Otto
*Non-Executive



DIGBY WELLS
ENVIRONMENTAL

This document has been prepared by Digby Wells Environmental.

Report Type:	Heritage Impact Assessment
Project Name:	Environmental Authorisations, IWULA and Mining Right Application for the proposed Weltevreden Mine, Mpumalanga
Project Code:	MBU5710

Name	Responsibility	Signature	Date
Shannon Hardwick HRM Consultant ASAPA Member: 451	HIA Compilation		January 2021
Justin du Piesanie Divisional Manager: Social and Heritage Services ASAPA Member 270	Technical Review		
Xanthe Taylor Project Manager	Report Review		

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.

DECLARATION OF INDEPENDENCE

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact Person: Shannon Hardwick

Digby Wells House
48 Grosvenor Road
Turnberry Office Park, Bryanston
2191

Tel: 011 789 9495
Fax: 011 789 9498
E-mail: shannon.hardwick@digbywells.com

I, Shannon Hardwick as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Mbuyelo Group (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the proposed Weltevreden Mine in the Mpumalanga Province.



Full Name:	Shannon Hardwick
Title/ Position:	Heritage Resources Management Consultant
Qualification(s):	MSc
Experience (Years):	2 years
Registration(s):	Association of Southern African Professional Archaeologists (ASAPA) International Council on Monuments and Sites (ICOMOS) South Africa

DECLARATION OF INDEPENDENCE

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact Person: Justin du Piesanie

Digby Wells House
 48 Grosvenor Road
 Turnberry Office Park, Bryanston
 2191

Tel: 011 789 9495
 Fax: 011 789 9498
 E-mail: justin.dupiesanie@digbywells.com

I, Justin du Piesanie as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Mbuyelo Group (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the proposed Weltevreden Mine in the Mpumalanga Province.



Full Name:	Justin du Piesanie
Title/ Position:	Divisional Manager: Social and Heritage Services
Qualification(s):	MSc
Experience (Years):	12 years
Registration(s):	Association of Southern African Professional Archaeologists (ASAPA) International Council on Monuments and Sites (ICOMOS) South Africa International Association for Impact Assessment South Africa (IAIAsa)

EXECUTIVE SUMMARY

Xivono Mining (Pty) Ltd (hereinafter Xivono), a subsidiary of the Mbuyelo Group (Pty) Ltd (hereinafter Mbuyelo), hold an approved Prospecting Right for the Weltevreden Mining Project. Xivono intend to convert this to a Mining Right (the Project). The Weltevreden Mine will consist of two open cast pits, OC1 and OC2, and shipping containers will be used as workshops and offices. The open cast pits will occupy a combined 362 ha and the workshops and offices are not expected to exceed 300 m² (0.03 ha). Additional surface infrastructure is not expected to exceed an additional hectare.

Xivono appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake the Environmental Authorisation (EA) process, including an Environmental Impact Assessment (EIA) and Water Use Licence (WUL) Application, in compliance with the applicable national environmental legislation. Digby Wells completed a Heritage Resources Management (HRM) process in support of the EIA and in compliance with Sections 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

This report constitutes the Heritage Impact Assessment (HIA) report, the third deliverable of the HRM process. Digby Wells completed the following activities as part of the HIA:

- Identification of potential impacts to heritage resources based on the Project description and Project activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that may result from the Project;
- Recommending feasible management measures and/or mitigation strategies to avoid and/or minimise negative impacts and enhance potential benefits resulting from the Project; and
- Submission of the HIA report to the Heritage Resource Authorities (HRAs) for Statutory Comment as required under Section 38(8) of the NHRA.

Digby Wells identified three heritage resources with very high to low Cultural Significance (CS) values¹. The table below provides a summary of the CS values of the identified heritage resources.

The Project presents risks of negative direct impact to the heritage resources. The current proposed infrastructure design layout suggests that the Project will directly impact BGG-001 and Wf-001. The The potential direct impact to BGG-001 includes damage to or the destruction of individual graves within the burial ground or the burial ground as a whole. The

¹ Digby Wells determined the CS values of the identified heritage resources during the second deliverable of the HRM process, the Heritage Scoping Report (HSR). The results of the HSR informed this report and, as such, the HIA must be read in conjunction with the HSR.

potential direct impact to Wf-001 includes damage to or the destruction of individual structures within the werf or the werf itself.

Based on Digby Wells' understanding of the Project, while considering the defined cultural landscape and known heritage resources, Digby Wells recommends:

- Xivono amends the infrastructure design of the discard dump, where possible, to avoid negative indirect impacts to BGG-001 and Wf-001 and include a 100 m and 50 m no-go buffer zone around the heritage resources respectively;
- Where heritage resources are conserved *in situ*, Xivono must develop and Conservation Management Plan (CMP) to manage *in situ* heritage resource. The CMP must include any applicable mitigation measures, access protocols, management strategies and proposed monitoring schedules and outline the roles and responsibilities of those involved. This document must be submitted to the HRAs for approval prior to implementation;
- Xivono can consider adaptive re-use of the structures included in Wf-001. This will require a permit issued by Mpumalanga Provincial Heritage Resources Authority (MPHRA) in terms of Section 34 of the NHRA and must also comply with the requirements of Chapter III of the NHRA Regulations;
- Where the redesign of the infrastructure layout is not feasible and where Wf-001 is impacted, Xivono must complete the Permit application process in compliance with Section 34 of the NHRA and Chapter III of the NHRA Regulations and obtain a permit prior to the commencement of the construction phase of the Project;
- Where the redesign of the infrastructure layout is not feasible and where BGG-001 is impacted, Xivono must complete a consultation process in compliance with Chapter XI of the NHRA Regulations prior to the construction of OC2:
 - Should Xivono and the community agree on the way forward, Xivono may submit a Grave Relocation Process (GRP) permit application to South African Heritage Resources Agency (SAHRA) for consideration;
 - It must be noted however that the granting of such a permit lies solely with SAHRA and the outcome cannot be guaranteed;
- Digby Wells recommends that Xivono establish and implement a strategy for continuous communication with the community. Such consultation can:
 - Suggest the feasibility of undertaking a GRP;
 - Assist in the identification of heritage resources within the Project area, including burial grounds and graves, prior to damage through Project activities; and
 - Aid in the negotiation and agreement regarding the appropriate management and issues of access related to identified heritage resources; and

- A project-specific Chance Find Procedure (CFP) must be developed and approved by the Heritage Resource Authorities (HRAs) prior to the commencement of the construction of Project-related infrastructure.
- Where these recommendations are adopted, Digby Wells does not object to the implementation of the Project from a heritage perspective.

Summary of the CS of Identified Heritage Resources

Resource ID	Description	INTEGRITY	CS
VRYH	<i>Vryheid Formation</i>	4	Very High
BGG-001	Burial Grounds & Graves	4	Very High
Wf-001 and Wf-002	Historical Built Environment	4	Low

Summary of the Potential Risk to Heritage Resources

Unplanned event	Potential impact
Accidental exposure of <i>in situ</i> historical built environment resources during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA.
Accidental exposure of <i>in situ</i> archaeological material during the implementation of the Project.	
Accidental exposure of <i>in situ</i> burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA.
Accidental exposure of human remains during the construction phase of the Project.	

Summary of the Impact Assessment

Impact	Duration	Extent	Intensity	Consequence	Probability	Significance
	Pre-mitigation:					
Direct impact to burial grounds and graves	Permanent	International	Extremely high - negative	Extremely detrimental	Certain	Major - negative
Direct impact to historical werwe of Low CS	Permanent	Limited	Very low - negative	Moderately detrimental	Certain	Minor - negative
Impact	Post-mitigation:					
Direct impact to burial grounds and graves	Beyond project life	Limited	High - positive	Moderately beneficial	Likely	Minor - positive
Direct impact to historical werwe of Low CS	Permanent	Very Limited	Very low - positive	Slightly beneficial	Likely	Minor - positive

TABLE OF CONTENTS

1	Introduction	1
1.1	Project Background and Description.....	1
1.2	Project Alternatives	2
1.3	Terms of Reference.....	3
1.4	Scope of Work.....	3
1.5	Expertise of the Specialist	6
1.6	Structure of the Report	7
2	Legislative and Policy Framework.....	10
3	Constraints and Limitations	13
4	Methodology.....	14
4.1	Defining the Study Area.....	14
4.2	Statement of Cultural Significance.....	15
4.3	Definition of Heritage Impacts.....	15
4.4	Secondary Data Collection	16
4.5	Primary Data Collection.....	18
4.6	Site Naming Convention.....	18
5	Cultural Heritage Baseline Description	18
5.1	Summary of the Cultural Heritage Baseline	19
5.2	Results from the Pre-disturbance Survey	23
5.2.1	<i>Existing Environment</i>	23
5.2.2	<i>Identified Heritage Resources</i>	25
6	Impact Assessment.....	29
6.1	Cultural Significance of the Identified Landscape	29
6.2	Heritage Impact Assessment.....	29
6.2.1	<i>Direct Impacts to Heritage Resources of Very High CS</i>	30
6.2.2	<i>Direct Impacts to Heritage Resources of Low CS</i>	31
6.3	Cumulative Impacts on the Cultural Landscape.....	33
6.4	Low Risks and Unplanned Events	34

7	Identified Heritage Impacts versus Socio-economic Benefit	36
8	Consultation	38
9	Recommendations	38
10	Conclusion	39
11	Works Cited.....	41

LIST OF TABLES

Table 1-1: Alternatives Considered for the Project	2
Table 1-2: Expertise of the Specialists	6
Table 1-3: Structure of the Report	7
Table 2-1: Applicable legislation considered in the HRM process	10
Table 2-2: Applicable policies considered in the HRM process	12
Table 3-1: Constraints and Limitations	13
Table 4-1: Impact definition	15
Table 4-2: Secondary Data Sources informing the HRM Process	17
Table 4-3: Aerial imagery considered	17
Table 4-4: Feature and Period Codes Relevant to this HIA	18
Table 5-1: Heritage Resources identified through the pre-disturbance survey.....	25
Table 6-1: Summary of the CS Assessment of the Identified Heritage Resources	29
Table 6-2: Summary of the Potential Direct Impact to Burial Grounds and Graves.....	30
Table 6-3: Summary of the Potential Direct Impact to Historical Built Environment Resources	32
Table 6-4: Summary of potential cumulative impacts	34
Table 6-5: Identified Heritage Risks that may Rise for Xivono	34
Table 6-6: Identified Unplanned Events and Associated Impacts	35
Table 7-1: Summary of the employment statistics within the regional study area	36

LIST OF FIGURES

Figure 5-1: Heritage Resources Identified Within the Greater Study Area	19
Figure 5-2: Photographs illustrating the current environment within the Project area	24
Figure 5-3: Historical imagery from 1955 for the Project area, showing points of interest....	26
Figure 5-4: Photographs of select heritage resources identified during the pre-disturbance survey	27
Figure 7-1: Employment status within the regional study area.....	37

LIST OF PLANS

Plan 1: Regional Project Setting.....	4
Plan 2: Local Setting and proposed Infrastructure Plan.....	5
Plan 3: Previously-identified Heritage Resources within the Regional Study Area.....	22
Plan 4: Results of the Pre-Disturbance Survey.....	28

LIST OF APPENDICES

Appendix A: Specialist CVs

Appendix B: HRM Methodology

Appendix C: PIA Report

1 Introduction

Xivono Mining (Pty) Ltd (hereinafter Xivono), a subsidiary of the Mbuyelo Group (Pty) Ltd (hereinafter Mbuyelo), hold an approved Prospecting Right² for the proposed Weltevreden Coal Mine, in the Mpumalanga Province. Xivono intend to convert their Prospecting Right into a Mining Right for the for the proposed Weltevreden Mining Project (the Project). To this effect, Xivono appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake the Environmental Authorisation (EA) process, including an Environmental Impact Assessment (EIA) and Water Use Licence (WUL) Application, in compliance with the:

- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA);
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- NEMA EIA Regulations, 2014 (Government Notice Regulations [GN R] 982 as amended by GN R 326);
- National Water Act, 1998 (Act No. 26 of 1998) (NWA); and
- National Environmental Management: Waste Act, 2008 (Act No 56 of 2008).

Digby Wells is undertaking a Heritage Resources Management (HRM) process in support of the EIA required for the aforementioned applications This report constitutes the Heritage Impact Assessment (HIA) report, inclusive of a Palaeontological Impact Assessment (PIA³), completed in compliance with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

1.1 Project Background and Description

The Project area is located approximately 8 km south of Belfast in the Emakhazeni Local Municipality (ELM) and the Nkangala District Municipality (NDM) of Mpumalanga. Plan 1 presents the regional setting of the Project. At present, Xivono intend to establish infrastructure on the portion of the Prospecting Right area to the west of the R33 road, although the Prospecting Right does cover some of the area to the east of the R33.

The proposed infrastructure includes two open-cast pits, OC1 and OC2. These pits will occupy 162 ha and 200 ha respectively. Xivono intend to utilise shipping containers for the mine offices and workshops, which will collectively encompass an area not expected to exceed 300 m² (0.03 ha). Additional surface infrastructure will include:

- A crushing and screening plant;

² Reference number MP 1320 PR. The Prospecting Licence will lapse on 22 August 2021 as authorised by the Department of Mineral Resources (DMR).

³ The PIA report has been attached as Appendix C.

- Lined trenches;
- Overburden dump;
- Pipelines;
- A Pollution Control Dam (PCD);
- A Run of Mine (RoM) pad; and
- Stockpiles.

This additional surface structure is not expected to exceed 1 ha in extent. Plan 2 depicts the local setting and the proposed infrastructure layout design.

1.2 Project Alternatives

The Final Scoping Report (FSR) presented a summary of several alternatives that had been considered for the Project. Table 1-1 highlights the types of alternatives considered and describes the consequences of these alternatives for the assessment of the impacts on the heritage resources within the Project area.

Table 1-1: Alternatives Considered for the Project

Alternatives Considered	Consequence for the HIA
Alternatives in the design and layout of the Project.	<p>The design and layout of the Project is not expected to change significantly as it has been informed by the results of a sensitivity mapping exercise undertaken by Digby Wells in the pre-application phase of the Project.</p> <p>Should the infrastructure layout change and affect areas that have not been included in the field surveys, Xivono must appoint a suitably-qualified archaeologist and/or palaeontologist to complete a walk-down of the proposed infrastructure design prior to the commencement of the construction of such infrastructure.</p>
Alternatives in the routing chosen for the transportation of coal. These will be explored in more detail in a Traffic Impact Assessment (TIA) in support of the EIA.	<p>It is anticipated that the alternative routes will utilise the proposed infrastructure layout and that the alternatives routing options will focus on infrastructure outside the Project area.</p> <p>Should the infrastructure layout change and affect areas that have not been included in the field surveys, Xivono must appoint a suitably-qualified archaeologist and/or palaeontologist to complete a walk-down of the proposed infrastructure design prior to the commencement of the construction of such infrastructure.</p>
Alternative mining methods.	<p>There is no change to the Project description as open cast mining remains the preferred alternative.</p>

Alternatives Considered	Consequence for the HIA
The 'no-go' alternative - the Project does not obtain approval or does not go ahead for any reason.	The potential environmental impacts associated with the Project will not occur. This includes the potential impacts to heritage resources as described in Section 6.2. However, the potential benefits associated with the Project (as described in Section 7) will also not occur.

This report considers the preferred Project design and layout.

1.3 Terms of Reference

Mbuyelo appointed Digby Wells to conduct an EA process applicable to the Project, of which the HRM process forms part. Digby Wells completed the HRM process in compliance with Sections 38(3) and 38(8) of the NHRA.

1.4 Scope of Work

The Scope of Work (SoW) for the specialist HRM process included the compilation of an HIA report to comply with the requirements encapsulated in Section 38(3) of the NHRA. Digby Wells completed the following activities as part of the SoW:

- Description of the predominant cultural landscape supported through primary and secondary data collection;
- Assessment of the Cultural Significance (CS) of the identified heritage resources;
- Identification of potential impacts to heritage resources based on the Project description and Project activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that may result from the Project;
- Recommending feasible management measures and/or mitigation strategies to avoid and/or minimise negative impacts and enhance potential benefits resulting from the Project; and
- Submission of the HIA report to the South African Heritage Resources Agency (SAHRA) and the Mpumalanga Provincial Heritage Resources Authority (MPHRA) for Statutory Comment as required under Section 38(8) of the NHRA.

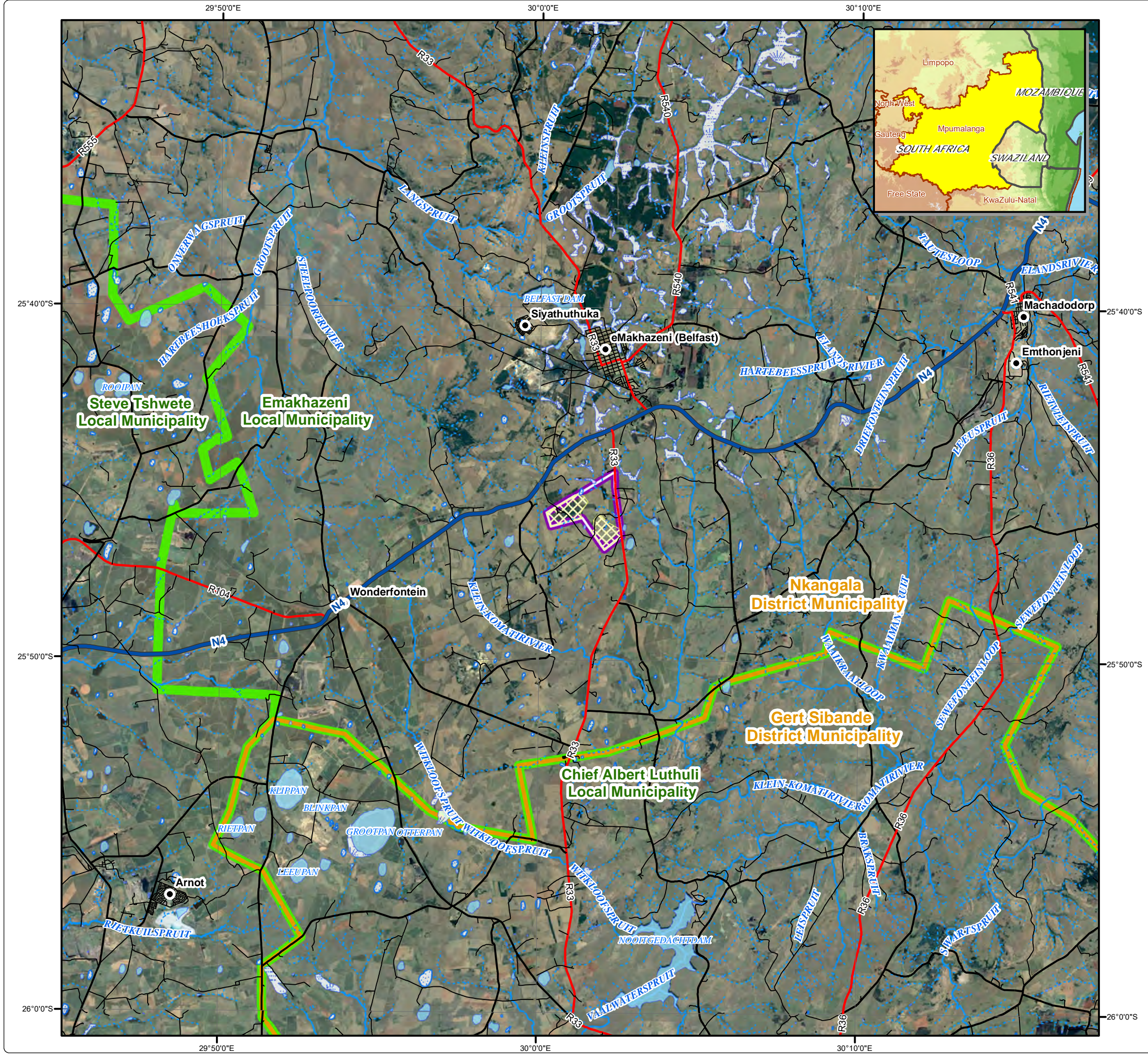
The HIA report is the third deliverable in the HRM process and presents an abbreviated description of the information that informed the preceding deliverables. The HIA report must therefore be read in conjunction with the Heritage Scoping Report (HSR⁴).

⁴ Case ID 14164, accessible at: <https://sahris.sahra.org.za/cases/mbu5710-weltevreden-coal-mining-project>

Proposed Weltevreden Mine Regional Setting

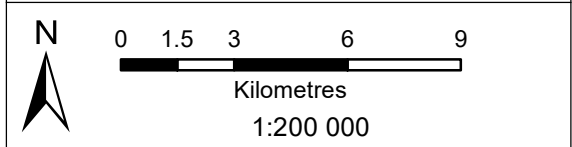
Legend

-  Project Area
-  Town/Settlement
-  National Route
-  Main Road
-  Secondary Road
-  Street
-  Dam/Lake
-  Marsh/Swamp
-  Non-perennial pan
-  Non-Perennial River/Stream
-  Perennial River/Stream
-  Pit Extent
-  District Municipality
-  Local Municipality



• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator Ref #: prv.MBU5710.201906.147
 Datum: WGS 1984 Revision Number: 1
 Central Meridian: 29°E Date: 27/06/2019



Proposed Weltevreden Mine

Local Setting

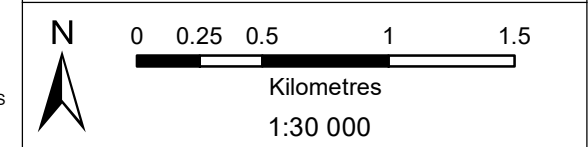
Legend

-  Project Area
-  National Route
-  Main Road
-  Secondary Road
-  Street
-  Dam/Lake
-  Marsh/Swamp
-  Non-perennial pan
-  Non-Perennial River/Stream
-  Perennial River/Stream
-  Pit Extent



• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator Ref #: prv.MBU5710.201906.146
 Datum: WGS 1984 Revision Number: 1
 Central Meridian: 29°E Date: 27/06/2019



1.5 Expertise of the Specialist

Table 1-2 presents a summary of the expertise of the specialists involved in the compilation of this report. The full CVs of these specialists are included in **Error! Reference source not found.**

Table 1-2: Expertise of the Specialists

Team Member	Bio Sketch
<p>Shannon Hardwick</p> <p>ASAPA Member: 451 ICOMOS Member 38048</p> <p>Years' Experience: 2</p>	<p>Shannon joined the Digby Wells team in May 2017 as a Heritage Management Intern and has most recently been appointed as a Heritage Resources Management Consultant. Shannon is an archaeologist who obtained a Master of Science (MSc) degree from the University of the Witwatersrand in 2013, specialising in historical archaeobotany in the Limpopo Province. She is a published co-author of one paper in <i>Journal of Ethnobiology</i>. Since joining Digby Wells, Shannon has gained generalist experience through the compilation of various heritage assessments, including Heritage Scoping Reports (HSRs), HIAs, Heritage Basic Assessment Reports (HBARs) and Section 34 permit applications. Her other experience includes compiling a Community Health, Safety and Security Management Plan (CHSSMP) and various social baselines, including researching Artisanal and Small-Scale Mining as part of a Livelihood Restoration Framework (LRF). Shannon's experience in the field includes pre-disturbance surveys in South Africa, Malawi and the Democratic Republic of the Congo and fieldwork in Malawi.</p>
<p>Justin du Piesanie</p> <p>ASAPA Member 270 ASAPA CRM Unit ICOMOS Member 14274 IAIASa Member</p> <p>Years' Experience: 12</p>	<p>Justin is the Divisional Manager for Social and Heritage Services at Digby Wells. Justin joined the company in August 2011 as an archaeologist and was subsequently made HRM Manager in 2016 and Divisional Manager in 2018. He obtained his Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. Justin also attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. Justin is a professional member of the Association of Southern African Professional Archaeologists (ASAPA) and accredited by the association's Cultural Resources Management (CRM) section. He is also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. He has over 12 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, NHRA Section 34 application processes, and Conservation Management Plans (CMPs). Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, Cameroon, the Democratic Republic of Congo, Liberia, Malawi, Mali and Senegal on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage.</p>

Team Member	Bio Sketch
	Furthermore, Justin has acted as a technical expert reviewer of HRM projects undertaken in Cameroon, Malawi and Senegal. Justin's current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

1.6 Structure of the Report

Table 1-3 presents the structure for the remainder of the report and indicates where each section meets the information requirements encapsulated in the NHRA and Appendix 6 of GN R 326 of 07 April 2017.

Table 1-3: Structure of the Report

Description	App. 6	NHRA	Section
Declaration that the report author(s) is (are) independent.	(b)	-	Page ii and iii
An indication of the scope of, and the purpose for which, the report was prepared.	(c)	-	1.3 1.4
Details of the person who prepared the report and their expertise to carry out the specialist study.	(a)	-	1.5
Outlines the legislative framework relevant to the specialist heritage study.	-	-	2
Identifies the specific constraints and limitations of the HIA, including any assumptions made and any uncertainties or gaps in knowledge.	(i)	-	3
Describes the methodology employed in the compilation of this HIA.	(e)	-	4 Appendix B
An indication of the quality and age of base data used for the specialist report.	(cA)	-	4.4
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment.	(d)	-	4.5
Provides the baseline cultural landscape.	-	38(3)(a)	5
Motivates for the defined CS of the identified heritage resources and landscape.	-	38(3)(b)	6



Description	App. 6	NHRA	Section
A description of the potential impacts to heritage resources by project related activities, including: <ul style="list-style-type: none"> - Existing impacts on the site; - Possible risks to heritage resources; - Cumulative impacts of the proposed development; - Acceptable levels of change; and - Heritage-related risks to the project. 	(cB)	38(3)(c)-	
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	(j)	38(3)(c)	
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives.	(f)	-	6 Plan 4
Considers the development context to assess the socio-economic benefits of the project in relation to the presented impacts and risks.	-	38(3)(d)	7
A description of any consultation process that was undertaken during the course of preparing the specialist report and the results of such consultation.	(o)	38(3)(e)	8
A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	(p)	38(3)(e)	
Details the specific recommendations based on the contents of the HIA.	-	38(3)(g)	9
An identification of any areas to be avoided, including buffers.	(g)		
Any mitigation measures for inclusion in the Environmental Management Programme (EMPr)	(k)		
Any conditions for inclusion in the environmental authorisation.	(l)		
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	(m)		



Description	App. 6	NHRA	Section
A reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	(n)	38(3)(g)	9
Collates the most salient points of the HIA and concludes with the specific outcomes and recommendations of the study.	-	38(3)(f) 38(3)(g)	10
Lists the source material used in the development of the report.	(cA)	-	11
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	(h)	-	Plan 4
Any other information requested by the competent authority.	(q)	-	-

2 Legislative and Policy Framework

Table 2-1: Applicable legislation considered in the HRM process

Applicable legislation used to compile the report	Reference where applied
<p><u>Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)</u></p> <p>Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that –</p> <ol style="list-style-type: none"> 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 	<p>The HRM process was undertaken to identify heritage resources and determine heritage impacts associated with the Project.</p> <p>As part of the HRM process, applicable mitigation measures, monitoring plans and/or remediation were recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.</p>
<p><u>National Environmental Management Act, 1998 (Act No. 107 of 1998)</u></p> <p>The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that:</p> <p><i>The potential impact on the environment, socio-economic conditions and cultural heritage 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.</i></p> <p>The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.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.</p>	<p>The application process was undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA Regulations (2014) (as amended), promulgated in terms of NEMA.</p>

Applicable legislation used to compile the report	Reference where applied
<p><u>GN R. 982: Environmental Impact Assessment Regulations, 2014 (as amended by GN R 326 of 7 April 2017)</u></p> <p>These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes:</p> <ul style="list-style-type: none"> ▪ Regulation GN R. 983 (as amended by GN R 327) - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. ▪ Regulation GN R. 984 (as amended by GN R 325) – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process. ▪ Regulation GN R. 985 (as amended by GN R 324) – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed. 	<p>Refer to the Notification of Intent to Develop (NID⁵) and Final Scoping Report for a full description of the Listed Activities triggered by the proposed Project.</p> <p>To comply with the regulations, an EIA process must be completed in support of Environmental Authorisation in terms of Listing Notice 2. This HIA was completed to inform the EIA process to comply with Section 24 of the NEMA.</p>
<p><u>National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)</u></p> <p>The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections:</p> <ul style="list-style-type: none"> ▪ 5. General principles for HRM ▪ 6. Principles for management of heritage resources ▪ 7. Heritage assessment criteria and grading 	<p>The HIA was compiled to comply with Section 5, 38(3), (4) and (8) of the NHRA. This HIA was submitted to the responsible HRAs, which in this instance is SAHRA and MPHRA.</p>

⁵ Submitted to Case ID 14164, accessible at: <https://sahris.sahra.org.za/cases/mbu5710-weltevreden-coal-mining-project>

Applicable legislation used to compile the report	Reference where applied
<ul style="list-style-type: none"> ▪ 38. Heritage resources management <p>The Act requires that Heritage Resources Authorities (HRAs), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.</p>	
<p><u>NHRA Regulations, 2000 (GN R 548)</u></p> <p>The NHRA Regulations regulate the general provisions and permit application process in respect of heritage resources included in the national estate. Applications must be made in accordance with these regulations. The following Chapters are applicable to this assessment:</p> <ul style="list-style-type: none"> ▪ II. Permit Applications and General Provisions for Permits; ▪ III: Application for Permit: National Heritage Site, Provincial Heritage Site, Provisionally-Protected Place or Structure older than 60 years; ▪ IV: Application for Permit: Archaeological or Palaeontological or Meteorite; ▪ IX: Application for Permit: Burial Grounds and Graves; ▪ X: Procedure for Consultation regarding Protected Area; ▪ XI: Procedure for Consultation regarding Burial Grounds and Graves; and ▪ XII: Discovery of Previously Unknown Graves. 	<p>The HRM process was undertaken with cognisance of the applicable regulations. The proposed mitigation strategies and management measures must comply with these requirements.</p>

Table 2-2: Applicable policies considered in the HRM process

Applicable policies used to compile the report	Reference where applied
<p><u>SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) (2012)</u></p>	<p>The HIA and PIA reports were compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007, 2012).</p>

Applicable policies used to compile the report	Reference where applied
<p>The guidelines provide the minimum standards that must be adhered to for the compilation of a HIA and/or PIA report.</p> <p>Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows:</p> <ul style="list-style-type: none"> ▪ Background information on the Project; ▪ Background information on the cultural baseline; ▪ Description of the properties or affected environs; ▪ Description of identified sites or resources; ▪ Recommended field rating of the identified sites to comply with Section 38 of the NHRA; ▪ A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and ▪ Recommendations for mitigation or management of identified heritage resources. <p>Chapter II, Section 8 outlines the minimum requirements for a PIA report. The information requirements are similar as for the HIA report, but must additionally include a 1:50 000 geological map showing the geological context of the Project.</p>	

3 Constraints and Limitations

Digby Wells encountered constraints and limitations during the compilation of this report. Table 3-1 presents an overview of these limitations and the consequences.

Table 3-1: Constraints and Limitations

Description	Consequence
<p>Whilst every attempt was made to obtain the latest available information, the reviewed literature does not represent an exhaustive list of information sources for the various study areas.</p>	<p>The cultural heritage baseline presented in Section 5 below is considered accurate but may not include new data or information which may not have been made available to the public.</p>
<p>The final infrastructure design layout was not available at the time of the survey or compilation of this report.</p>	<p>Every effort was made to cover the extent of the study area⁶. The survey was focused on the proposed infrastructure layout current at the time of the survey; however, this layout did not include the additional surface infrastructure. Some heritage resources in the Project may therefore not have been identified.</p> <p>The infrastructure layout will be informed in part by the results of the heritage assessment.</p>

⁶ Refer to Section **Error! Reference source not found.** for a description of the study area.

Description	Consequence
<p>Whilst every attempt was made to survey the extent of the site-specific study area, this report does not present an exhaustive list of identified heritage resources. Overgrown vegetation limited visibility at the time of the pre-disturbance survey.</p>	<p>Previously unidentified heritage resources may be encountered. Should this occur, Xivono must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.</p>
<p>Archaeological and palaeontological resources commonly occur at subsurface levels. These types of resources cannot be adequately recorded or documented by assessors without destructive and intrusive methodologies and without the correct permits issued in terms of Section 35 of the NHRA.</p>	<p>The reviewed literature, previously-completed heritage assessments and the results of the field survey are in themselves limited to surface observations.</p> <p>Subsurface tangible heritage may be exposed during Project activities. Should this occur, Xivono must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.</p>

4 Methodology

This section includes a summary of the information included in the HSR⁷. This section also describes methodologies employed specifically in the HIA component of the HRM process.

4.1 Defining the Study Area

Digby Wells defined four nested study areas for the purposes of the HRM process. These study areas include:

- The *site-specific study area*: the farm portions extent associated with the proposed Project, including a 500 m buffer area;
- The *Prospecting Right area*: the farm portions included in the existing Prospecting Right held by Xivono;
- The *local study area*: the area bounded by the local municipality, in this instance, ELM, with particular reference to the immediate surrounding properties and/or farms; and
- The *regional study area*: the area bounded by the district municipality, which here is NDM.

⁷ For more detailed information on the methodologies employed in the HRM process, refer to Appendix B or Section 4 in the HSR.

4.2 Statement of Cultural Significance

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 could be independently reproduced by another specialist with the same information, should it be required. The Digby Wells CS Determination Methodology combines the nine attributes described in Section 3(3) of the NHRA into four themes: aesthetic, historical, scientific and social.

The SAHRA Minimum Standards requires heritage assessments include Field Ratings for identified heritage resources to comply with Section 38(8) of the NHRA. Digby Wells provides numerical ratings of identified heritage resources in line with the system of grading outlined in Section 7 of the NHRA. These numerical ratings relate to the recommended grading of heritage resources and guide decision-making in terms of the minimum required mitigation measures and the management responsibilities in terms of Section 8 of the NHRA

Error! Reference source not found. includes a more detailed methodology statement.

4.3 Definition of Heritage Impacts

Potential impacts to heritage resources may manifest differently across geographical areas or diverse communities when one considers the simultaneous effect to the tangible resource and social repercussions associated with the intangible aspects. Furthermore, potential impacts may concurrently influence the CS of heritage resources. This assessment therefore considers three broad categories adapted from Winter & Baumann (2005, p. 36). These are described in

Table 4-1: Impact definition

Category	Description
Direct Impact	Affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense but can often be erroneously assessed as high-ranking.
Indirect Impact	Occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its CS that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any direct impact, its significance is affected to the extent that it can ultimately result in the loss of the resource itself.
Cumulative Impact	Result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:

Category	Description
	<ul style="list-style-type: none"> ▪ Additive: the simple sum of all the effects, e.g. the reclamation of a historical TSF will minimise the sense of the historic mining landscape. ▪ Synergistic: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the removal of all historical TSFs will sterilise the historic mining landscape. ▪ Time crowding: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building could be high. ▪ Neutralizing: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes from a historic to modern mining landscape could reduce the overall impact on the sense-of-place of the study area. ▪ Space crowding: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

4.4 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 HIA 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 HIA includes a summary and discussion of the most relevant findings. Table 4-2 lists the sources consulted in the literature review (refer to Section 11 for more detailed references).

Table 4-2: Secondary Data Sources informing the HRM Process

Reviewed Secondary Data		
Databases		
Genealogical Society of South Africa (2011)	University of the Witwatersrand (Wits) database (2010)	
SAHRIS Database	SAHRIS Palaeo-Sensitivity Map (SAHRA, 2017)	
SAHRIS Cases		
Case ID:102	Case ID: 11829	Case ID: 13002
Case ID: 13006	Case ID: 6278	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		

Digby Wells employed historical layering as a technique to identify potential heritage resources afforded general protection by Sections 34 and 35 of the NHRA during the HSR. 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 4-3 below lists the sources of historical imagery.

Table 4-3: 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

4.5 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. The surveys were non-intrusive (i.e. no sampling was undertaken). The aim of the surveys was 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. Plan 4 presents the results of the pre-disturbance survey, including the tracklogs and waypoints in relation to the proposed infrastructure.

4.6 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. 14164/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 4-4 presents a list of the relevant period and feature codes (refer to Section 5 for an explanation of what these terms mean).

Table 4-4: 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).

5 Cultural Heritage Baseline Description⁸

The HSR includes a description of the cultural heritage landscape, based on the identified heritage resources within the local and regional study area⁹. This section provides summary

⁸ The geological context and palaeontological sensitivities within the Project area will be described in the PIA report included in Appendix C.

⁹ For more detailed information on the cultural heritage baseline condition, refer to Section 5 in the HSR.

of the cultural heritage landscape as relevant to the predominant identified heritage resources as presented in Figure 5-1. These comprise historical built environment and burial ground and grave resources. This notwithstanding, a battlefield has been recorded in the greater study area. The summarised cultural heritage baseline description will therefore focus on the historical period.

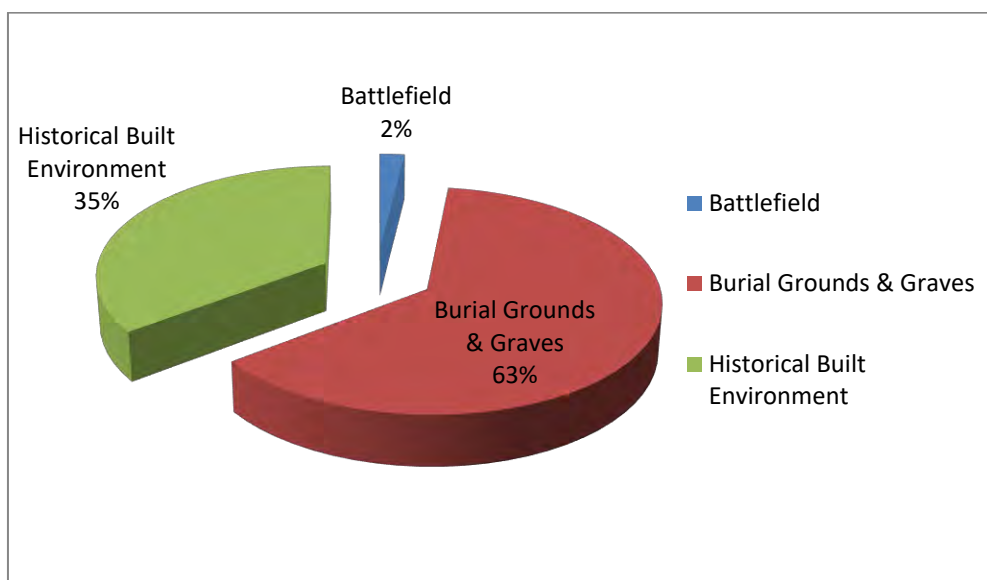


Figure 5-1: Heritage Resources Identified Within the Greater Study Area

5.1 Summary of the Cultural Heritage Baseline

The historical period¹⁰ 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 Later Farming Community (LFC) and historical period is largely artificial, and there is a large amount of overlap between the two.

Migration, population growth, climatic variation and trade to the east significantly impacted the Pedi, Koni and other groups on the Mpumalanga Highveld throughout the transition from the LFC to the historical period and throughout the historical period itself. 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

¹⁰ In southern Africa, especially in Mpumalanga, the last 500 years represents a formative period that is marked by enormous internal economic invention and political experimentation that shaped the cultural contours and categories of modern identities outside of European contact. This period is currently not well documented, as highlighted by the 500-year initiative (Swanepoel, et al., 2008).

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 Ohrigstad¹¹ 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.

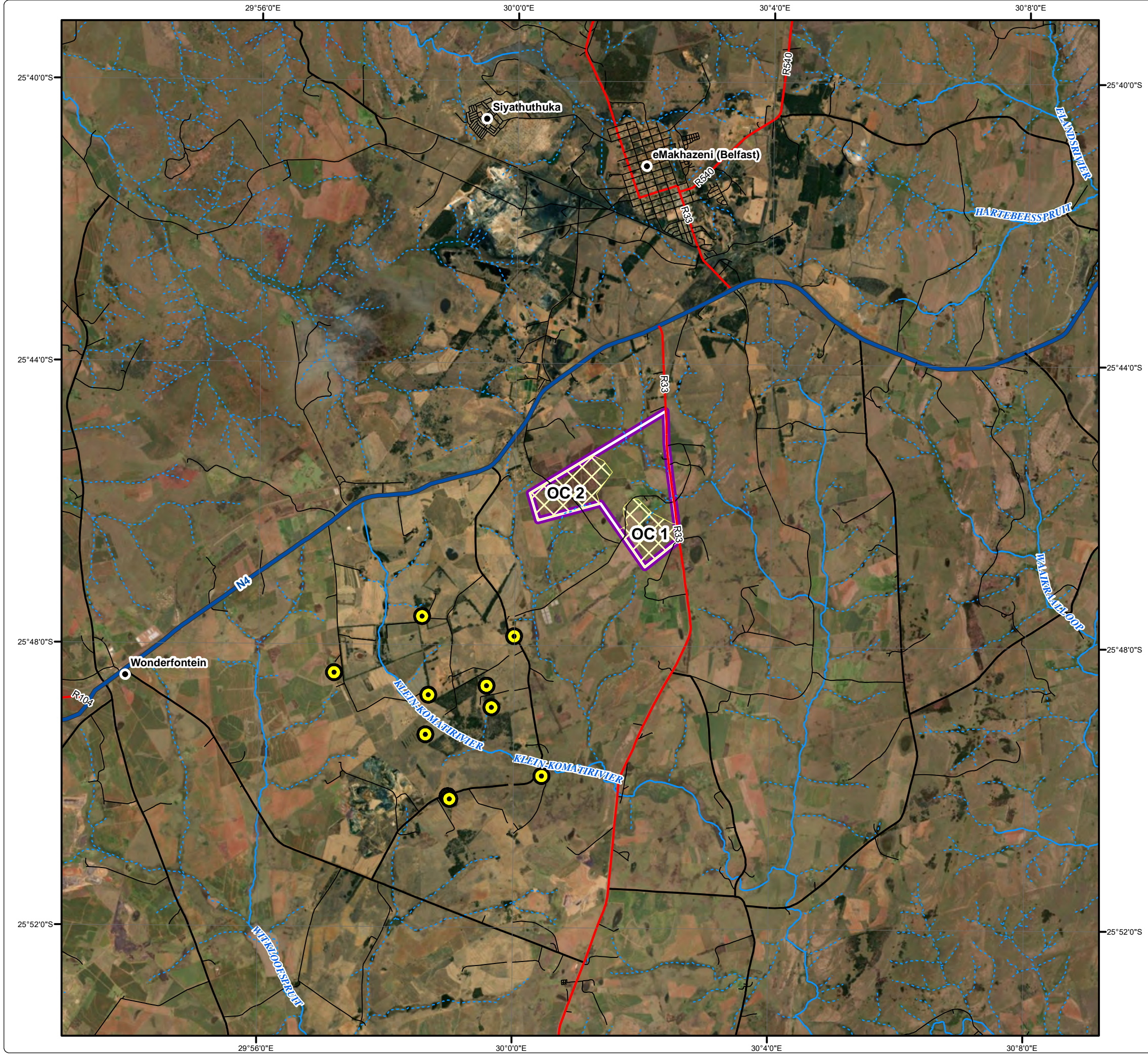
¹¹ Approximately 140 km north-east of Belfast.

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 is one notable battle associated with the South African War within the regional study area, Bakenlaagte (October 30th, 1901), approximately 110 km southwest of the Project area. The battlefield included in Figure 5-1 relates to this battle. No major military engagements related to the war are known for the Belfast area.

Proposed Weltevreden Mine HRM Site Matrix

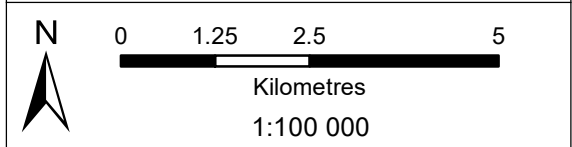
Legend

- HRM Site Matrix
- Project Area
- Town/Settlement
- National Route
- Main Road
- Secondary Road
- Street
- Non-Perennial River/Stream
- Perennial River/Stream
- Pit Extent



Projection: Transverse Mercator
 Datum: WGS 1984
 Central Meridian: 29°E

Ref #: prv.MBU5710.201907.240
 Revision Number: 1
 Date: 29/07/2019



5.2 Results from the Pre-disturbance Survey

5.2.1 Existing Environment

The Project exists within the Mesic Highveld bio-region of the Grassland Biome. The specific vegetation type within which the Project area falls is the Eastern Highveld Grassland unit (GM12). This vegetation unit is located on slightly to moderately undulating plains and is associated with the shales and sandstones of the *Vryheid Formation*¹² of the Karoo Supergroup (Mucina & Rutherford, 2010). 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 as much of the type has been transformed through cultivation, dams, plantations, mines and urbanisation.

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. A plantation has been established within and adjacent to the Project area. Figure 5-2 below presents the current environment at the time of the pre-disturbance survey.

¹² Mucina and Rutherford (2010) refer to the *Madzaringwe Formation* of the Karoo Supergroup. However, this formation is limited within the Limpopo region and does not occur within the Project area.



Figure 5-2: Photographs illustrating the current environment within the Project area

5.2.2 Identified Heritage Resources

Within the Project area, Digby Wells identified heritage resources affiliated with the historical period. Table 5-1 presents a description of the results identified during the survey. Figure 5-4 presents photographs of select heritage resources. Plan 4 presents the results of the pre-disturbance survey, including the geographical data. Plan 4 also includes points identified during the historical layering exercise completed in the HSR.

Figure 5-3 presents the results of the historical layering. 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. These points were not ground-truthed during the pre-disturbance survey and no photographs were taken at these points. Digby Wells recommends that Xivono investigate these points prior to the commencement of construction activities. Should any foundations or structures occur at these points, Xivono must treat these remains as historical structures in full compliance with Section 34 of the NHRA¹³.

Wf-001 refers to a werf which includes a mix of modern and historical structures, as described in Table 5-1 and presented in Figure 5-4. Similarly, STE-001 was identified during the pre-disturbance survey and is visible on the 1955 imagery.

Table 5-1: Heritage Resources identified through the pre-disturbance survey¹⁴

Site Name	Description
BGG-001	<p>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 ten visible graves, one of which is outside the fence perimeter. This appears to be a child grave.</p> <p>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.</p>

¹³ As per the present proposed infrastructure, HLP-02 falls within the proposed OC1 and is therefore at risk of direct negative impacts.

¹⁴ In accordance with new SAHRA procedures, the GPS co-ordinates of these heritage resources have not been included in documents available to the public.

Site Name	Description
Wf-001	<p>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.</p> <p>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.</p>
Wf-002	<p>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.</p>

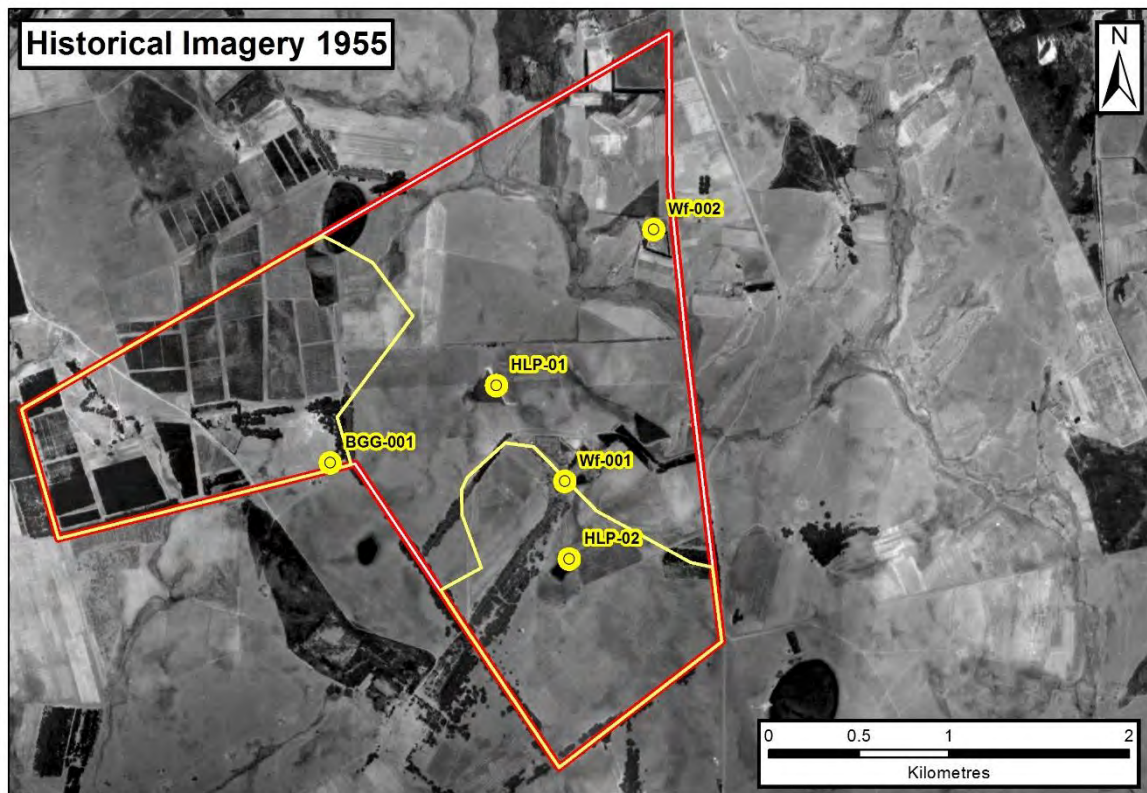


Figure 5-3: Historical imagery from 1955 for the Project area, showing points of interest



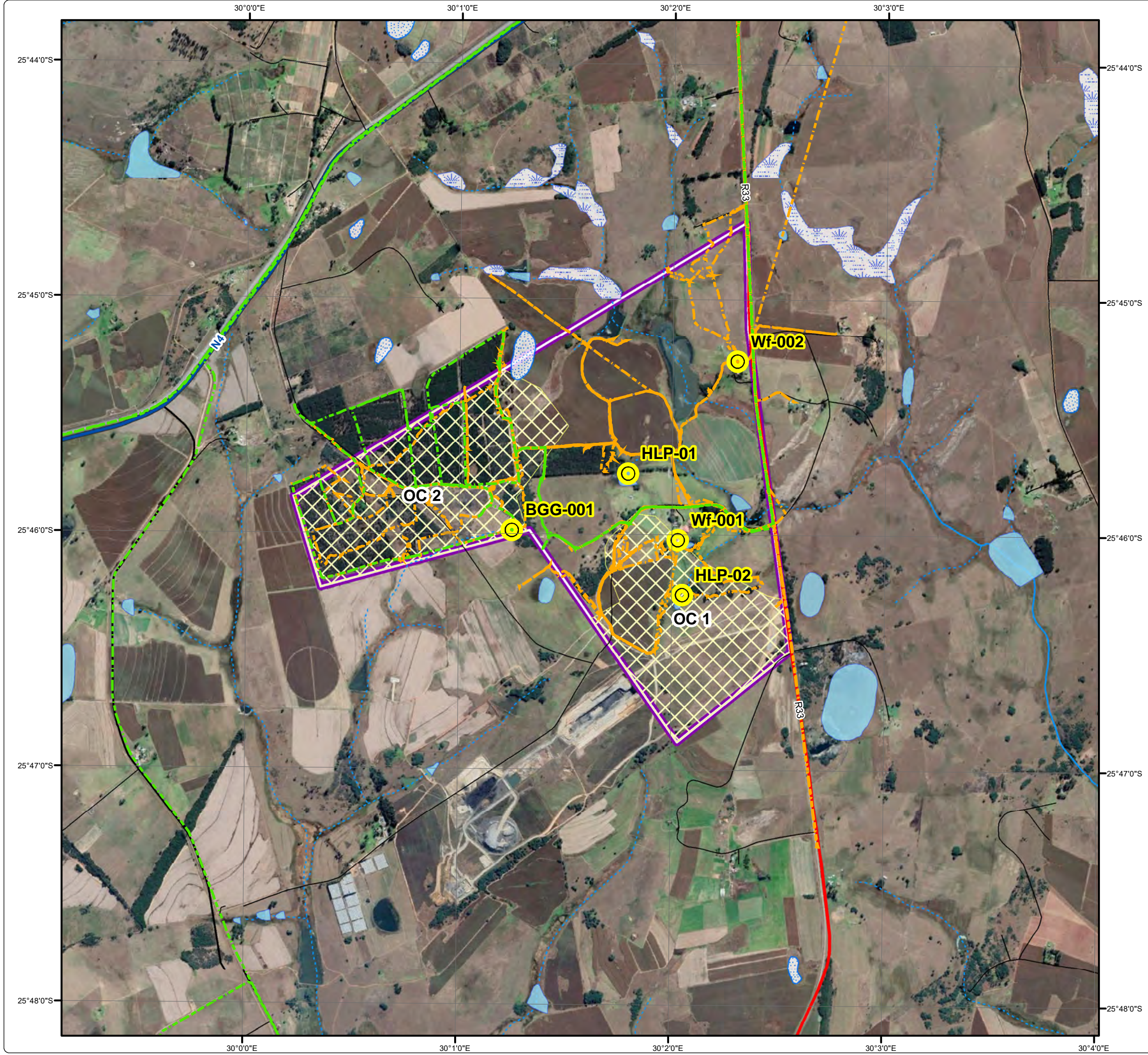
Figure 5-4: Photographs of select heritage resources identified during the pre-disturbance survey

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

Proposed Weltevreden Mine Identified Heritage Resources

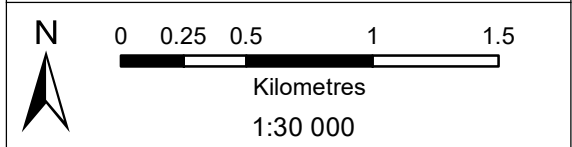
Legend

-  Project Area
-  Identified Heritage Resources
-  Pre Disturbance Survey
-  Site Inspection
-  National Route
-  Main Road
-  Secondary Road
-  Street
-  Dam/Lake
-  Marsh/Swamp
-  Non-perennial pan
-  Non-Perennial River/Stream
-  Perennial River/Stream
-  Pit Extent



• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator Ref #: prv.MBU5710.201907.012
 Datum: WGS 1984 Revision Number: 1
 Central Meridian: 29°E Date: 03/07/2019



6 Impact Assessment

6.1 Cultural Significance of the Identified Landscape

Table 6-1 presents a summary¹⁵ of the CS of the identified heritage resources as well as the mitigation measures as per the SAHRA Minimum Standards (2007). Project-specific mitigation measures and management strategies are detailed in Section 6.2.

Table 6-1: Summary of the CS Assessment of the Identified Heritage Resources

Resource ID	Description	CS and Field Rating	Recommended Mitigation based on SAHRA Minimum Standards (2007)
VRYH	<i>Vryheid Formation</i>	Very High Grade I	Project design must change to avoid all change to resource. The resource must be conserved in entirety and included in Conservation Management Plan (CMP).
BGG-001	Burial Grounds & Graves	Very High Grade I	Project design must change to avoid all change to resource. The resource must be conserved in entirety and included in Conservation Management Plan (CMP). A Grave Relocation Process (GRP) may be necessary should the project design not be changed.
Wf-001 Wf-002	Historical Built Environment	Low General Protection IV B	Resource must be recorded before destruction, including detailed site mapping. Surface sampling may be required.

6.2 Heritage Impact Assessment

The assessment of potential impacts to heritage resources considers the activities associated with the Project as described in Section 1.1 specifically the construction and operation of the aforementioned open pit coal mine and associated infrastructure. No indirect impacts to the identified heritage resources are anticipated; however, there are potential direct impacts.

The current proposed infrastructure design layout suggests that the Project will directly impact BGG-001 and Wf-001. BGG-001 is located within the proposed OC2 footprint and WF-001 partially falls within the proposed OC1 footprint. Section 6.2.1 discusses the potential impacts to BGG-001 and Section 6.2.2 discusses the potential impacts to Wf-001.

¹⁵ The CS of the identified heritage resources within the site-specific study area was discussed in Section 6.1 of the HSR. It is not repeated here for the sake of brevity.

6.2.1 Direct Impacts to Heritage Resources of Very High CS

The potential direct impact to BGG-001 includes damage to or the destruction of individual graves within the burial ground or the burial ground as a whole. This is expected to occur given the position of the burial ground in relation to the proposed open-cast pit OC2. Table 6-2 presents a summary of the assessment of the direct impacts to BGG-001.

Table 6-2: Summary of the Potential Direct Impact to Burial Grounds and Graves

IMPACT DESCRIPTION: Direct Impact to BGG-001				
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent (7)	The destruction of or damage to the burial ground or individual graves will be a permanent impact that cannot be reversed.	Consequence: Extremely detrimental (-21)	Significance: Major – negative (-147)
Extent	International (7)	Should the resource be impacted, this could have international reputational repercussions.		
Intensity x type of impact	Extremely high - negative (-7)	The destruction of or damage to the burial ground or individual graves will be considered a major change to a heritage resource of Very High CS.		
Probability	Certain (7)	Should the Project go ahead as planned, this impact will occur.		

IMPACT DESCRIPTION: Direct Impact to BGG-001				
Dimension	Rating	Motivation		
MITIGATION:				
<p>Xivono must consider altering the Project design to avoid the heritage resource and implement a 100 m buffer around BGG-001. Where the burial ground is conserved <i>in situ</i>, Xivono must develop and implement a CMP to conserve the physical heritage resource and the CS value of the resource. The CMP must be submitted to the HRAs for approval prior to the commencement of the construction phase of the Project. Xivono must demarcate the burial ground and provide access¹⁶ as required to members of the community.</p> <p>Where Project redesign is not possible to remove the identified impact, Xivono must complete the consultation process in compliance with Chapter XI of the NHRA Regulations. Should there be agreement between Xivono and the community regarding the way forward, Xivono can then submit a GRP application to SAHRA for consideration.</p> <p>The post-mitigation scenario assumes that the burial ground is conserved <i>in situ</i>.</p>				
POST-MITIGATION				
Duration	Beyond project life (6)	Should the CMP be implemented, the benefits will extend beyond the Project lifecycle.	Consequence: Moderately beneficial (13)	Significance: Minor - positive (65)
Extent	Limited (2)	The CMP will affect individual heritage resources within the Project area.		
Intensity x type of impact	High - positive (5)	<i>In situ</i> conservation would be considered a minor change to a heritage resource of Very High CS		
Probability	Likely (5)	Based on Digby Wells' understanding of the Project, it is possible that this recommendation is more feasible than a GRP. This must, however, be confirmed. Should the CMP be implemented, the benefits are most likely to occur.		

6.2.2 Direct Impacts to Heritage Resources of Low CS

The potential direct impact to Wf-001 includes damage to or the destruction of individual structures within the werf or the werf as a whole. This is expected to occur given the position

¹⁶ Unrestricted access can occur in compliance with the mine's visitor access protocols and in compliance with the Mine Health and Safety Act, 1996 (Act No. 29 of 1996). The local community and NoK must be sensitised to these procedures as early as possible in the Project lifecycle

of the werf in relation to the proposed open-cast pit OC1. Table 6-3 presents a summary of the assessment of the direct impacts to Wf-001.

Table 6-3: Summary of the Potential Direct Impact to Historical Built Environment Resources

IMPACT DESCRIPTION: Direct Impact to Wf-001				
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent (7)	The destruction of or damage to the werf will be a permanent impact that cannot be reversed.	Consequence: Moderately detrimental (-10)	Significance: Minor – negative (-70)
Extent	Limited (2)	The negative impact will not be applicable to all heritage resources within the Project area.		
Intensity x type of impact	Very low - negative (-1)	Damage to or the destruction of this heritage resource will be considered a major change to a heritage resource of low CS.		
Probability	Certain (7)	Should the Project go ahead as planned, this impact will occur.		
MITIGATION:				
<p>Digby Wells recommends that Xivono consider altering the Project layout design to avoid negative impacts to this heritage resource and incorporate a 50 m buffer between the resource and OC1. Xivono must then either include this resource in the CMP and conserve the werf <i>in situ</i> or adapt the site to use the structure(s) during the Project lifecycle. The latter option will require a permit issued by MPHRA in terms of Section 34 of the NHRA and Chapter III of the NHRA Regulations.</p> <p>Should Project redesign not be feasible, Xivono must record the werf through detailed mapping and photographs to preserve the resource through the record. Xivono must complete a Section 34 Destruction Permit application process in compliance with Chapter III of the NHRA Regulations and obtain the permit prior to the commencement of the construction phase of the Project.</p> <p>The post-mitigation scenario assumes that conserving the werf through the record is the preferred option.</p>				

IMPACT DESCRIPTION: Direct Impact to Wf-001				
Dimension	Rating	Motivation		
POST-MITIGATION				
Duration	Permanent (7)	Should the werf be preserved through the record, this will be considered a permanent change to the resource.	Consequence: Slightly beneficial (9)	Significance: Minor – positive (45)
Extent	Very limited (1)	The preservation of the resource though the record will apply only to part of the resource as the physical fabric will be destroyed.		
Intensity x type of impact	Very low - positive (1)	Preservation through the record will be considered a moderate change to a heritage resource of low CS.		
Probability	Likely (5)	Based on Digby Wells' understanding of the Project, it is possible that preservation through the record is the more feasible option. This must, however, be confirmed. Should this recommendation be implemented, the benefits are most likely to occur.		

6.3 Cumulative Impacts on the Cultural Landscape

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

This Project in conjunction with other planned developments in line with the strategic development plans for the Mpumalanga Province requires consideration to identify the possible in-combination effects of various impacts to known heritage resources. Table 6-4 presents a summary of the possible cumulative impacts of the Project.

Table 6-4: Summary of potential cumulative impacts

Type	Cumulative Impact	Direction of Impact	Extent of Impact
Additive, Synergistic	<p>The development and operation of the proposed Project will add to the existing and proposed infrastructure in the area and will contribute to the degradation of the sense-of-place of the cultural landscape.</p> <p>Considering the greater development landscape, the effects from the various proposed developments will interact to produce a total greater effect on the cultural landscape and degradation thereof.</p>	Negative	Local
Neutralizing	<p>The <i>in-situ</i> conservation of some or all of the identified heritage resources will conserve tangible markers of the historical landscape. This will be a positive cumulative impact on the cultural landscape and may counter some of the degradation of the sense-of-place as described above.</p>	Positive	Local

6.4 Low Risks and Unplanned Events

This section considers the potential risks to protected heritage resources, as well as the potential heritage risks that could arise for Xivono in terms of implementation of the Project. These two aspects are discussed separately.

Section 5.2.2 describes the heritage resources identified during the pre-disturbance survey; however, this is not an exhaustive list of all heritage resources within the Project area. If heritage resources are subsequently identified, and where Xivono knowingly does not take proactive management measures, potential risks to Xivono may include litigation in terms of Section 51 of the NHRA and social or reputational repercussions. Table 6-5 presents a summary of the primary risks that may arise for Xivono.

Table 6-5: Identified Heritage Risks that may Rise for Xivono

Description	Primary Risk
Heritage resources with a high CS rating are inherently sensitive to any development in so far that the continued survival of the resource could be threatened. In addition to this, certain heritage resources are formally protected thereby restricting various development activities.	Negative Record of Decision (RoD) and/or development restrictions issued by the Institute and/or SAHRA in terms of Section 38(8) of the NHRA.

Description	Primary Risk
<p>Impacting on heritage resources formally and generally protected by the NHRA without following due process.</p> <p>Due process may include social consultations and/or permit application processes to SAHRA and/or MPHRA.</p>	<p>Fines</p> <p>Penalties</p> <p>Seizure of Equipment</p> <p>Compulsory Repair / Cease Work Orders</p> <p>Imprisonment</p>

In the event that additional heritage resources are identified during construction of the proposed infrastructure, potential risks to those heritage resources will need to be assessed. Table 6-6 provides an overview of these potential unplanned events, the subsequent impact that may occur and mitigation measures and management strategies to remove or reduce these risks.

Table 6-6: Identified Unplanned Events and Associated Impacts

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Accidental exposure of <i>in situ</i> historical built environment sites during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA	<p>Establish Project-specific Chance Find Procedures (CFPs) and Fossil Finds Procedures (FFPs) as a condition of authorisation.</p> <p>Refer to Section 9 for more detailed recommendations.</p> <p>The PIA report included in Appendix C includes an FFP for implementation.</p>
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA	
Accidental exposure of <i>in situ</i> archaeological material during the implementation of the Project.		
Accidental exposure of <i>in situ</i> burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA.	
Accidental exposure of human remains during the construction phase of the Project.		

7 Identified Heritage Impacts versus Socio-economic Benefit

This section provides a brief overview¹⁷ of the socio-economic context within which the Project will be situated. The site-specific study area falls within Ward 1 of the ELM and NDM. This section presents a summary of the information included in the Integrated Development Plans (IDPs) for these municipalities. Information from Wazimap (2017) has been used to supplement the IDP data.¹⁸

The 2011 census recorded 4 039 393 people living in Mpumalanga, which accounts for approximately 7.8% of the national population (Statistics South Africa, 2011; Wazimap, 2017). Of the provincial population, 1 309 129 people lived in Nkangala, which is the median population of the three district municipalities in the province. NDM includes six local municipalities, of which ELM is the smallest in terms of population. As of the 2011 census, 47 216 people lived in the municipality.

Unemployment is a major challenge within the regional study area (ELM, 2019; NDM, 2019). In both ELM and NDM, unemployment is especially high with regard to the youth. Within the ELM, there has been a decrease in unemployment from 25.9% in 2011 to 22.8% in 2017. In the same year, the youth unemployment rate was 34.2%.

Table 7-1: Summary of the employment statistics within the regional study area

Employment Statistics	Ward 1		ELM		NDM	
	No.	%	No.	%	No.	%
Total Population	5 853	-	47 216	-	1 309 129	-
Working Age (15-64)	3 359	57.4	28 647	60.7	795 693	60.8
Employed	1 747	29.9	13 671	29	355 487	27.2

Adapted from Statistics South Africa (2011) and Wazimap (2017)

Figure 7-1 below presents a breakdown of the employment status of the populations within the regional study area. In this figure, “not applicable” refers to members of the community who are not of economically-active age (i.e. those who are younger than 15 and aged 65 and older). Discouraged work seeker refers to those who are unemployed but are no longer seeking employment.

¹⁷ For a more detailed analysis of the socio-economic context and the positive and negative impacts of the Project, refer to the Social Impact Assessment (SIA) undertaken in support of the EIA.

¹⁸ These data were used because it realigns the 2011 Census data captured and presented by Statistics South Africa (2011) with new municipal boundaries used in the 2016 Municipal Elections (Open Up, 2017). This report uses the Census 2011 data as data from the 2016 Community Survey are not yet available at ward level.

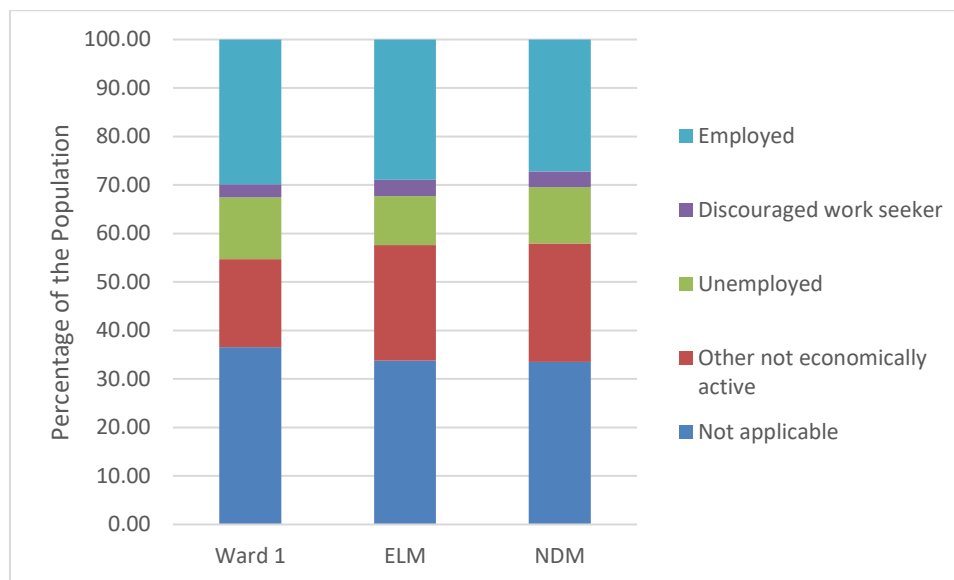


Figure 7-1: Employment status within the regional study area

Adapted from Wazimap (2017)

A threat identified in the ELM IDP (2019) is an increase in unemployment due to the closure of mines within the municipality. As of 2016, mining was the largest contributor to Mpumalanga's economy, contributing 25.8%. This is a slight increase from 2011, where the mining sector – still the biggest contributor – contributed 25.2% of the economy. Mining has been identified as a major 'job driver' to be targeted in the creation of future employment opportunities. Mining has seen growth in the NDM (2019). Within the NDM, mining employed 13.7% of the workforce in 2016 and is not one of the top three employers. This is a decrease from 2011 when mining accounted for 16.5% employment.

Based on the review of the applicable planning documents and the motivation above, the potential socio-economic benefits that may result from the Project outweigh the identified impacts and risks to known heritage resources within the site-specific study area. This statement is supported by the following:

- Given Digby Wells' understanding of the Project, the identified impacts and risks can be managed through the proposed recommendations; and
- The proposed Project will contribute to the regional and local economies;
- The proposed Project is expected to contribute directly (and indirectly) to the short-term and long-term employment of people in an area where unemployment is a challenge.

8 Consultation

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the project;
- To provide I&APs with an opportunity to engage and provide comment on the project;
- To draw on local knowledge by identifying environmental and social concerns associated with the project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

The Public Participation Process (PPP) has been completed in part, as a process separate to the heritage specialist assessment. No formal consultation was undertaken as part of this assessment. Should any I&AP comments be submitted in relevance to heritage resources during the SEP, these will be considered in the final EIA report.

Site surveys can often present an opportunity for informal consultation with specific stakeholders (usually farm owners, managers and employees). This consultation can result in the identification of burial grounds and graves – importantly, these could include formal burial grounds or graves, sometimes with no visible surface markers – or in the identification of sacred sites or other places of importance, which may not otherwise be identified.

During the pre-disturbance survey, seven individuals working on the property or passing through the property were asked if they were aware of any burial grounds and graves or other heritage resources in the immediate aware. A pair of women were aware of BGG-001 and no one else was aware of any additional heritage resources.

9 Recommendations

To mitigate against the identified direct and indirect impacts against cultural heritage resources, Digby Wells recommends:

- Xivono amends the infrastructure design of the discard dump, where possible, to avoid negative indirect impacts to BGG-001 and Wf-001 and include a 100 m and 50 m no-go buffer zone around the heritage resources respectively;
- Where heritage resources are conserved *in situ*, Xivono must develop and CMP to manage *in situ* heritage resource. The CMP must include any applicable mitigation measures, access protocols, management strategies and proposed monitoring schedules and outline the roles and responsibilities of those involved. This document must be submitted to the HRAs for approval prior to implementation;

- Xivono can consider adaptive re-use of the structures included in Wf-001. This will require a permit issued by MPHRA in terms of Section 34 of the NHRA and must also comply with the requirements of Chapter III of the NHRA Regulations;
- Where the redesign of the infrastructure layout is not feasible and where Wf-001 is impacted, Xivono must complete the Permit application process in compliance with Section 34 of the NHRA and Chapter III of the NHRA Regulations and obtain a permit prior to the commencement of the construction phase of the Project;
- Where the redesign of the infrastructure layout is not feasible and where BGG-001 is impacted, Xivono must complete a consultation process in compliance with Chapter XI of the NHRA Regulations prior to the construction of OC2:
 - Should Xivono and the community agree on the way forward, Xivono may submit a GRP permit application to SAHRA for consideration;
 - It must be noted however that the granting of such a permit lies solely with SAHRA and the outcome cannot be guaranteed;
- Digby Wells recommends that Xivono establish and implement a strategy for continuous communication with the community. Such consultation can:
 - Suggest the feasibility of undertaking a GRP;
 - Assist in the identification of heritage resources within the Project area, including burial grounds and graves, prior to damage through Project activities; and
 - Aid in the negotiation and agreement regarding the appropriate management and issues of access related to identified heritage resources; and
- A project-specific CFP must be developed and approved by the HRAs prior to the commencement of the construction of Project-related infrastructure.

10 Conclusion

The aim of the HRM process was to comply with regulatory requirements contained within Section 38 of the NHRA through the following:

- Defining the cultural landscape within which the Project is situated;
- Identifying, as far as is feasible, heritage resources that may be impacted upon by the project as well as define the CS;
- Assessing the possible impacts to the identified heritage resources;
- Considering the socio-economic benefits of the Project; and
- Providing feasible mitigation and management measures to avoid, remove or reduce perceived impacts and risks.

These objectives were met as presented in Sections 5 through 9 above. Based on the understanding of the Project while considering the results of this assessment, Digby Wells does not object to the Project provided the recommendations detailed above are adopted.

11 Works Cited

- 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.
- 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.
- ELM, 2019. *Emakhazeni Local Municipality IDP 2018/2019*, eMakhazeni: Government Policy Document.
- Esterhuysen, A. & Smith, J., 2007. Stories in Stone. In: P. Delius, ed. *Mpumalanga: History and Heritage: reclaiming the past, defining the future*. Pietermatitzburg: University of KwaZulu-Natal Press, pp. 41-67.
- Genealogical Society of South Africa, 2011. *Google Earth Cemetery Initiative*. Google Earth Database: Genealogical Society of South Africa Database.
- Landau, P. S., 2010. *Popular Politics in the History of South Africa, 1400-1948*. Cambridge: Cambridge University Press.
- Makhura, T., 2007. Early Inhabitants. In: *Mpumalanga: History and Heritage..* Pietermaritzburg: The University of KwaZulu-Natal Press, pp. 91-135.
- Mucina, L. & Rutherford, M. C., 2010. *The Vegetation of South Africa, Lesotho and Swaziland*. CD Edition ed. Pretoria: South African National Biodiversity Insitute (SANBI).
- NDM, 2019. *Nkangala District Municipality Integrated Development Plan: 2nd Review 2019-2020*, Middelburg: Government Policy Document.
- Open Up, 2017. *Wazimap updated with 2016 Municipal Election Results and new municipalities*. [Online]
Available at: <https://openup.org.za/articles/wazimap-2016-update.html>
[Accessed 25 September 2019].
- 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.

SAHRA, 2017. *PalaeoSensitivity Map*. [Online]
Available at: <http://www.sahra.org.za/sahris/map/palaeo>
[Accessed 02 September 2019].

Statistics South Africa, 2011. *Statistics by place*. [Online]
Available at: http://www.statssa.gov.za/?page_id=964
[Accessed 25 September 2019].

Swanepoel, N., Esterhuysen, A. B. & Bonner, P., 2008. *Five Hundred Years Rediscovered: Southern African Precedents and Prospects*. Johannesburg: Wits University Press.

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].

Wazimap, 2017. *Wazimap*. [Online]
Available at: <https://wazimap.co.za/>
[Accessed 25 September 2019].

Winter, S. & Baumann, N., 2005. *Guidelines for involving heritage specialists in EIA processes: first edition*. CSIR Report No ENV-S-C 2005 053 E, Cape Town: Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning.

WITS, 2010. *Archaeological Site Database*, Johannesburg: Department of Geography, Archaeology and Environmental Science.

Heritage Impact Assessment

Environmental Authorisations, IWULA and Mining Right Application for the proposed
Weltevreden Mine, Mpumalanga

MBU5710



DIGBY WELLS
ENVIRONMENTAL

Appendix A: Specialist CVs



Miss Shannon Hardwick
 Heritage Resources Management Consultant
 Social and Heritage Services
 Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2013	MSc (Archaeology)	University of the Witwatersrand
2010	BSc (Honours) (Archaeology)	University of the Witwatersrand
2009	BSc	University of the Witwatersrand
2006	Matric	Rand Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Fair	Basic

3 Employment

Period	Company	Title/position
2019 to Present	Digby Wells Environmental	Heritage Resources Management Consultant
2017 to 2019	Digby Wells Environmental	Assistant Heritage Resources Management Consultant
2017 to 2017	Digby Wells Environmental	Social and Heritage Services Intern
2016 to 2017	Tarsus Academy	Facilitator
2011 to 2016	University of the Witwatersrand	Teaching Assistant
2011	University of the Witwatersrand	Collections Assistant

4 Experience

I joined the Digby Wells team in May 2017 as a Heritage Management Intern and has most recently been appointed as a Heritage Resources Management Consultant. I am an archaeologist and obtained a Master of Science (MSc) degree from the University of the Witwatersrand in 2013, specialising in historical archaeobotany in the Limpopo Province. I am a published co-author of one paper in *Journal of Ethnobiology*.

Since joining Digby Wells, I have gained generalist experience through the compilation of various heritage assessments, including Notification of Intent to Develop (NIDs), Heritage Scoping Reports (HSRs), Heritage Impact Assessment (HIA) reports, Heritage Basic Assessment Reports (HBARs) and permit applications to undertake permitted activities in terms of Sections 34 and 35 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). I have also obtained experience in compiling socio-economic documents, including a Community Health, Safety and Security Management Plan (CHSSMP) and social baselines and data analysis for Projects in South Africa, Malawi, Mali and Sierra Leone. My fieldwork experience includes heritage pre-disturbance surveys in South Africa, Malawi and the Democratic Republic of the Congo and social fieldwork in Malawi.

I am a registered member of the Association of Southern African Professional Archaeologists (ASAPA) and the International Council on Monuments and Sites (ICOMOS).

5 Project Experience

My project experience is listed in the table below.

Project Experience

Project Title	Name of Client	Project Location	Date of Completion	Project / Experience Description
Environmental Authorisation for the Dagsoom Coal Mining Project near Ermelo, Mpumalanga Province	Dagsoom Coal Mining (Pty) Ltd	Ermelo, Mpumalanga Province	Ongoing	Heritage Impact Assessment
Regional Tailings Storage Facility Heritage Mitigations	Ergo Mining (Pty) Ltd	Randfontein, Gauteng	Ongoing	Section 34 Permit Application Process
Weltervreden Mine Environmental Authorisation, Water Use Licence and Mining Right Application Project	Mbuyelo Group (Pty) Ltd	Belfast, Mpumalanga	Ongoing	Heritage Impact Assessment



Project Title	Name of Client	Project Location	Date of Completion	Project / Experience Description
Environmental Authorisation for the proposed Lephalale Pipeline Project, Limpopo Province	MDT Environmental (Pty) Ltd	Lephalale, Limpopo Province	2019	Notification of Intent to Develop
Heritage Resources Management Process Update for the Exxaro Matla Mine	Exxaro Coal Mpumalanga (Pty) Ltd	Kriel, Mpumalanga Province	2019	Heritage Site Management Plan Update
Environmental Authorisation for the proposed Musina-Makhado Special Economic Zone Development Project, Limpopo Province	Limpopo Economic Development Agency	Vhembe District Municipality, Limpopo Province	Ongoing	Heritage Impact Assessment Project Management
Songwe Hills Rare Earth Elements Project	Mkango Resources Limited	Phalombe District, Malawi	Ongoing	Heritage Impact Assessment
Elandsfontein Colliery Burial Grounds and Graves Chance Finds	Anker Coal and Mineral Holdings SA (Pty) Ltd Elandsfontein Colliery (Pty) Ltd	Clewer, Emalahleni, Mpumalanga Province	December 2018	Site Inspection Project Management
Environmental Authorisation Process to Decommission a Conveyor Belt Servitude, Road and Quarry at Twistdraai East Colliery	Sasol Mining (Pty) Ltd	Secunda, Mpumalanga Province	Ongoing	Notification of Intent to Develop
Environmental and Social Impact Assessment for the Bougouni Lithium Project, Mali	Future Minerals S.A.R.L.	Bougouni, Mali	Ongoing	Heritage Impact Assessment
Environmental Authorisation for the Nomalanga Estates Expansion Project, KwaZulu-Natal	Nomalanga Property Holdings (Pty) Ltd	Greytown, KwaZulu-Natal	Ongoing	Heritage Impact Assessment
Environmental Authorisation for the Temo Mine proposed Rail, Road and Pipeline Development, Limpopo Province	Temo Coal Mining (Pty) Ltd	Lephalale, Limpopo Province	Ongoing	Heritage Impact Assessment



Project Title	Name of Client	Project Location	Date of Completion	Project / Experience Description
Gorumbwa RAP Audit	Randgold Resources Limited	Kibali Sector, Democratic Republic of the Congo	December 2018	Resettlement Action Plan Audit
Sasol Sigma Defunct Colliery Surface Mitigation Project: Proposed Rover Diversion and Flood Protection Berms	Sasol Mining (Pty) Ltd	Sasolburg, Free State Province	November 2018	Notification of Intent to Develop
Basic Assessment and Regulation 31 Amendment / Consolidation for Sigma Colliery: Mooikraal and Sigma Colliery: 3 Shaft	Sasol Mining (Pty) Ltd	Sasolburg, Free State Province	Ongoing	Notification of Intent to Develop
Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province	Sasol Mining (Pty) Ltd	Sasolburg, Free State Province	July 2018	Heritage Basic Assessment Report Update
Constructed Landfill Site for the Sierra Rutile Limited Mining Operation, Southern Province, Sierra Leone	Sierra Rutile Limited	Southern Province, Sierra Leone	May 2019	Social Impact Assessment
Environmental Impact Assessment for the Klipspruit Colliery Water Treatment Plant and associated pipeline, Mpumalanga	South32 SA Coal Holdings (Pty) Ltd	Ogies, Mpumalanga Province	Ongoing	Notification of Intent to Develop; Social baseline
Proposed construction of a Water Treatment Plant and associated infrastructure for the Treatment of Mine-Affected Water at the Kilbarchan Colliery	Eskom Holdings SOC Limited	Newcastle, KwaZulu-Natal Province	Ongoing	Heritage Impact Assessment
Belfast Implementation Project	Exxaro Coal Mpumalanga (Pty) Ltd	Belfast, Mpumalanga Province	Ongoing	Section 34 Permit Application

Project Title	Name of Client	Project Location	Date of Completion	Project / Experience Description
Newcastle Landfill Project	GCS Water and Environmental Consultants	Newcastle, KwaZulu-Natal	March 2019	Heritage Impact Assessment
NHRA Section 34 Permit Application process for the Davin and Queens Court Buildings on Erf 173 and 174, West Germiston, Gauteng Province	IDC Architects	Johannesburg, Gauteng Province	May 2018	Section 34 Permit Application Process
Basic Assessment and Environmental Management Plan for the Proposed pipeline from the Mballi Colliery to the Tweefontein Water Reclamation Plant, Mpumalanga Province	HCI Coal (Pty) Ltd Mballi Colliery	Ogies, Mpumalanga Province	February 2018	Heritage Basic Assessment Report
The South African Radio Astronomy Observatory Square Kilometre Array Heritage Impact Assessment and Conservation Management Plan Project	The South African Radio Astronomy Observatory (SARAO)	Carnarvon, Northern Cape Province	July 2018	Heritage Impact Assessment; Conservation Management Plan
Environmental Impact Assessment for the proposed Future Developments within the Sun City Resort Complex	Sun International (Pty) Ltd	Rustenburg, North West Province	Ongoing	Heritage Impact Assessment Conservation Management Plan Social Baseline
Environmental Fatal Flaw Analysis for the Mabula Filling Station	Mr van den Bergh	Waterberg, Limpopo Province	November 2017	Fatal Flaw Analysis
Environmental Impact Assessment for the Blyvoor Gold Mining Project near Carletonville, Gauteng Province	Blyvoor Gold Capital (Pty) Ltd	Carletonville, Gauteng	Ongoing	Notification of Intent to Develop; Social Baseline

Project Title	Name of Client	Project Location	Date of Completion	Project / Experience Description
Heritage Resources Management Process for the Exxaro Matla Mine	Exxaro Coal Mpumalanga (Pty) Ltd	Kriel, Mpumalanga Province	October 2018	Heritage Impact Assessment
Liwonde Additional Studies	Mota-Engil Africa	Liwonde, Malawi	June 2018	Community Health, Safety and Security Management Plan
Environmental Impact Assessment for the Millsite TSF Complex	Sibanye-Stillwater	Randfontein, Gauteng	December 2017	Heritage Impact Assessment
Heritage Resources Management Process for the Portion 296 of the farm Zuurfontein 33 IR Proposed Residential Establishment Project	Shuma Africa Projects (Pty) Ltd	Ekurhuleni (Johannesburg), Gauteng	June 2017	Notification of Intent to Develop
NHRA Section 35 Archaeological Investigations, Lanxess Chrome Mine, North-West Province	Lanxess Chrome Mine (Pty) Ltd	Rustenburg, North West Province	August 2017	Archaeological Phase 2 Mitigation
Environmental and Social Input for the Pre-Feasibility Study	Birimium Gold	Bougouni, Mali	October 2018	Pre-Feasibility Study; Heritage Impact Assessment

6 Professional Registration

Position	Professional Body	Member Number
Member	Association of Southern African Professional Archaeologists (ASAPA)	451
Member	International Council on Monuments and Sites (ICOMOS)	38048

7 Publications

Esterhuysen, A.B. & Hardwick, S.K. 2017. Plant remains recovered from the 1854 siege of the Kekana Ndebele, Historic Cave, Makapan Valley, South Africa. *Journal of Ethnobiology* 37(1): 97-119.



Mr. Justin du Piesanie
 Divisional Manager
 Social and Heritage Services
 Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2015	Continued Professional Development, Intermediate Project Management Course	PM.Ideas: A division of the Mindset Group
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
2018 to present	Digby Wells Environmental	Divisional Manager: Social and Heritage Services
2016-2018	Digby Wells Environmental	Unit Manager: Heritage Resources Management
2011-2016	Digby Wells Environmental	Heritage Management Consultant: Archaeologist
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Experience

I joined the company in August 2011 as an archaeologist. Subsequently, Digby Wells appointed me as the Heritage Unit Manager and Divisional Manager for Social and Heritage Services in 2016 and 2018 respectively. I obtained my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. I further attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. I am a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. I am also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. I have over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. I gained further generalist experience since my appointment at Digby Wells in Botswana, Burkina Faso, Cameroon, the Democratic Republic of Congo, Liberia, Malawi, Mali, Senegal and Tanzania on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, I have acted as a technical expert reviewer of HRM projects undertaken in Cameroon and Senegal. As Divisional Manager for Social and Heritage Services at Digby Wells Environmental, I manage several large capital Projects and multidisciplinary teams placing me in the best position to identify and exploit points of integration between the HRM process and greater social landscape. This approach to HRM, as an integrated discipline, is grounded in

international HRM principles and standards that has allowed me to provide comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving the strategic objectives of our clients, as well as maintain or enhance Cultural Significance of the relevant cultural heritage resources.

5 Project Experience

Please see the following table for relevant Project experience:

PROJECT		LOCATION	DATES		PROJECT TYPE		CLIENT		
LLWDP-II Process	HRM	Lesotho	2020	-	Heritage Assessment	Impact	Lesotho Lowlands Development Project II	Water	
Ergo City Heritage Mitigations	Deep	Johannesburg, Gauteng, South Africa	2020	-	Heritage Assessment, Rescue Permit Application and Monitoring	Impact	Ergo (Pty) Ltd		
Marshall Barracks Archaeological Monitoring	Street	Johannesburg, Gauteng, South Africa	2020	-	Archaeological Monitoring		GVK-Siya Zama Construction		
Exxaro Belfast Inspection	Site	Belfast, Mpumalanga, South Africa	2020	2020	Site Inspection		Exxaro Coal Mpumalanga (Pty) Ltd		
Matla Mine 1 GRP		Kriel, Mpumalanga, South Africa	2020	-	Grave Relocation		Exxaro Coal Mpumalanga (Pty) Ltd		
Mafube RAP and GRP		Middelburg, Mpumalanga, South Africa	2019	-	Grave Relocation		Mafube Coal		
SARAO SKA Project: Heritage Mitigations		Carnarvon, Northern Cape, South Africa	2019	-	Heritage Management and Mitigation		SARAO		
Kibali Kalimva & Ikamva Pit ESIA		Orientele Province, Democratic Republic of Congo	2019	2019	Heritage Assessment	Impact	Barrick Gold Corporation		
Ergo City Deep HSMP		Johannesburg, Gauteng, South Africa	2019	2019	Heritage Management Plan	Site	Ergo (Pty) Ltd		
Ergo RTSF Section 34 Process		Westonaria, Gauteng, South Africa	2019	-	Section 34 Destruction Permit Applications		Ergo (Pty) Ltd		

PROJECT	LOCATION	DATES		PROJECT TYPE		CLIENT
Twyfelaar EIA	Ermelo, Mpumalanga, South Africa	2019	2019	Heritage Assessment	Impact	Dagsoom Coal Mining (Pty) Ltd
Sasol River Diversion	Sasolburg, Free State, South Africa	2019	2019	Heritage Assessment	Impact	Sasol Mining
Sun City EIA and CMP	Pilanesberg, North-West Province, South Africa	2018	2019	Heritage Assessment and Conservation Management Plan	Impact and	Sun International
Exxaro Matla HRM	Kriel, Mpumalanga, South Africa	2017	2019	Heritage Assessment and Conservation Management Plan	Impact	Exxaro Coal Mpumalanga (Pty) Ltd
Exxaro Belfast GRP	Belfast, Mpumalanga, South Africa	2013	2019	Grave Relocation		Exxaro Coal Mpumalanga (Pty) Ltd
Eskom Northern KZN Strengthening	KwaZulu- Natal, South Africa	2016	2018	Heritage Assessment	Impact	ILISO Consulting
Thabametsi GRP	Lephalale, Limpopo Province, South Africa	2017	2018	Grave Relocation		Exxaro Resources Ltd
SKA HIA and CMP	Carnarvon, Northern Cape, South Africa	2017	2018	Heritage Assessment and Conservation Management Plan	Impact and	SARAO
Grootegeeluk Watching Brief	Lephalale, Limpopo Province, South Africa	2017	2017	Watching Brief		Exxaro Resources Ltd
Matla HSMP	Kriel, Mpumalanga Province, South Africa	2017	2017	Heritage Management Plan	Site	Exxaro Coal Mpumalanga (Pty) Ltd
Ledjadja Coal Borrow Pits	Lephalale, Limpopo Province, South Africa	2017	2017	Heritage Assessment	Basic	Ledjadja Coal (Pty) Ltd
Exxaro Belfast Implementation Project PIA	Belfast, Mpumalanga, South Africa	2017	2017	Palaeontological Impact Assessment		Exxaro Coal Mpumalanga (Pty) Ltd

PROJECT	LOCATION	DATES	PROJECT TYPE	CLIENT	
Lanxess Chrome Mine Archaeological Mitigation	Rustenburg, North West Province, South Africa	2017	2017	Phase 2 Excavations	Lanxess Chrome Mine (Pty) Ltd
Tharisa Apollo EIA Project	KwaZulu-Natal, South Africa	2017	2017	Heritage Assessment Impact	GCS (Pty) Ltd
Queen Street Section 34 Process	Germiston, Johannesburg, Gauteng, South Africa	2017	2017	Section 34 Destruction Permit Applications	IDC Architects
Goulamina EIA Project	Goulamina, Sikasso Region, Mali	2017	2017	Heritage Assessment Impact	Birimian Limited
Zuurfontein Residential Establishment Project	Ekurhuleni, Gauteng, South Africa	2017	2017	Notification of Intent to Develop	Shuma Africa Projects
Kibali Grave Relocation Training and Implementation	Orientele Province, Democratic Republic of Congo	2017	2017	Grave Relocation	Randgold Resources Limited
Massawa EIA	Senegal	2016	2017	Heritage Assessment and Technical Reviewer Impact	Randgold Resources Limited
Beatrix EIA and EMP	Welkom, Free State, South Africa	2016	2017	Heritage Assessment Impact	Sibanye Stillwater
Sun City Chair Lift	Pilanesberg, North-West Province, South Africa	2016	2017	Notification of Intent to Develop and Heritage Assessment Basic	Sun International
Hendrina Underground Coal Mine EIA	Hendrina, Mpumalanga, South Africa	2016	2017	Heritage Assessment Impact	Umcebo Mining (Pty) Ltd
Elandsfontein Update	Clewer, Mpumalanga, South Africa	2016	2017	Heritage Assessment Impact	Anker Coal
Groningen and Inhambane PRA	Limpopo Province, South Africa	2016	2016	Heritage Assessment Basic	Rustenburg Platinum Mines Limited

PROJECT	LOCATION	DATES		PROJECT TYPE		CLIENT
Palmietkuilen MRA	Springs, Gauteng, South Africa	2016	2016	Heritage Assessment	Impact	Canyon Resources (Pty) Ltd
Copper Sunset Sand Mining S.102	Free State, South Africa	2016	2016	Heritage Assessment	Basic	Copper Sunset Sand (Pty) Ltd
Grootvlei MRA	Springs, Gauteng, South Africa	2016	2016	Notification of Intent to Develop		Ergo (Pty) Ltd
Lambda EMP	Mpumalanga, South Africa	2016	2016	Palaeontological Impact Assessment		Eskom Holdings SOC Limited
Kilbarchan Basic Assessment and EMP	Newcastle, KwaZulu- Natal, South Africa	2016	2016	Heritage Assessment	Basic	Eskom Holdings SOC Limited
Grootegeeluk Amendment	Lephalale, Limpopo Province, South Africa	2016	2016	Notification of Intent to Develop		Exxaro Coal Resources (Pty) Ltd
Garsfontein Township Development	Pretoria, Gauteng, South Africa	2016	2016	Notification of Intent to Develop		Leungo Construction Enterprises
Louis Botha Phase 2	Johannesburg, Gauteng, South Africa	2016	2016	Phase 2 Excavations		Royal Haskoning DHV
Sun City Heritage Mapping	Pilanesberg, North-West Province, South Africa	2016	2016	Phase 2 Mapping		Sun International
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Assessment Section 34 Destruction Application	Impact and 34 Permit	Bigen Africa Services (Pty) Ltd
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Assessment Section 34 Application	Impact and Permit	Bigen Africa Services (Pty) Ltd
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Assessment	Impact	Namane Resources (Pty) Ltd

PROJECT	LOCATION	DATES	PROJECT TYPE	CLIENT
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015 2016	Heritage Assessment Impact	Namane Resources (Pty) Ltd
Sibanye WRTRP	Gauteng, South Africa	2014 2016	Heritage Assessment Impact	Sibanye Stillwater
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014 2016	Technical Review	IMIC plc
NLGM Constructed Wetlands Project	Liberia	2015 2015	Heritage Assessment Impact	Aureus Mining
ERPM Section 34 Destruction Permits Applications	Johannesburg, Gauteng, South Africa	2015 2015	Section 34 Destruction Permit Applications	Ergo (Pty) Ltd
JMEP II EIA	Botswana	2015 2015	Heritage Assessment Impact	Jindal
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014 2015	Heritage Assessment Impact	Oakleaf Investment Holdings
Imvula Project	Kriel, Mpumalanga, South Africa	2014 2015	Heritage Assessment Impact	Ixia Coal
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014 2015	Heritage Assessment Impact	VM Investment Company
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012 2015	Heritage Assessment Impact	Aquarius Resources
Nzoro 2 Hydro Power Project	Orientele Province, Democratic Republic of Congo	2014 2014	Social consultation	Randgold Resources Limited
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014 2014	Heritage Assessment Impact	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014 2014	Heritage Assessment Impact	Ergo (Pty) Ltd
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014 2014	Heritage Assessment Impact	BHP Billiton

PROJECT		LOCATION	DATES		PROJECT TYPE		CLIENT
Klipspruit Extension: Weltevreden Project		Ogies, Mpumalanga, South Africa	2014	2014	Heritage Assessment	Impact	BHP Billiton
Ergo Pipeline Assessment	Rondebult Basic	Johannesburg, South Africa	2014	2014	Heritage Assessment	Basic	Ergo (Pty) Ltd
Kibali Project	ESIA Update	Orientele Province, Democratic Republic of Congo	2014	2014	Heritage Assessment	Impact	Randgold Resources Limited
GoldOne Consolidation	EMP	Westonaria, Gauteng, South Africa	2014	2014	Gap analysis		Gold One International
Yzermite PIA		Wakkerstroom, Mpumalanga, South Africa	2014	2014	Palaeontological Impact Assessment		EcoPartners
Sasol Mooikraal Assessment	Basic	Sasolburg, Free State, South Africa	2014	2014	Heritage Assessment	Basic	Sasol Mining
Rea Vaya Project	Phase II C	Johannesburg, Gauteng, South Africa	2014	2014	Heritage Assessment	Impact	ILISO Consulting
New Project	Liberty Gold	Liberia	2013	2014	Grave Relocation		Aureus Mining
Putu Project	Iron Ore Mine	Petroken, Liberia	2013	2014	Heritage Assessment	Impact	Atkins Limited
Sasol Twistdraai Project		Secunda, Mpumalanga, South Africa	2013	2014	Notification of Intent to Develop		ERM Southern Africa
Kibali Project	Gold Hydro-Power	Orientele Province, Democratic Republic of Congo	2012	2014	Heritage Assessment	Impact	Randgold Resources Limited
SEGA Project	Gold Mining	Burkina Faso	2013	2013	Technical Reviewer		Cluff Gold PLC
Consbrey and Collieries Project	Harwar	Breyton, Mpumalanga, South Africa	2013	2013	Heritage Assessment	Impact	Msobo Coal
Falea Environmental Assessment	Uranium Mine	Falea, Mali	2013	2013	Heritage Scoping		Rockgate Capital

PROJECT	LOCATION	DATES		PROJECT TYPE	CLIENT
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013	2013	Heritage Impact Assessment	ERM Southern Africa
SEGA Gold Mining Project	Burkina Faso	2012	2013	Socio Economic and Asset Survey	Cluff Gold PLC
Kibali Gold Project Grave Relocation Plan	Orientele Province, Democratic Republic of Congo	2011	2013	Grave Relocation	Randgold Resources Limited
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2012	Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012	2012	Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012	2012	Burial Grounds and Graves Survey	Platreef Resources
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012	2012	Phase 2 Excavations	Resources Generation
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012	2012	Watching Brief	Bokoni Platinum Mine
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010	2010	Heritage survey	Umlando Consultants
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010	2010	Archaeological Impact Assessment	ARM
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Excavations	Heritage Contracts Unit
De Brochen and Booyesdal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010	2010	Site Mapping Recording:	Heritage Contracts Unit
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Heritage Statement	Strategic Environmental Focus

PROJECT		LOCATION	DATES		PROJECT TYPE		CLIENT
Bathako Expansion	Mine	North-West Province, South Africa	2010	2010	Phase 2 Mapping		Heritage Contracts Unit
Wenzelrust Excavations		Shoshanguve, Gauteng, South Africa	2009	2009	Phase 2 Excavations		Heritage Contracts Unit
University of the Witwatersrand LIA Shelter Project	Parys	Free State, South Africa	2009	2009	Phase 2 Mapping		University of the Witwatersrand
Archaeological Assessment of Modderfontein Holdings	of AH	Johannesburg, Gauteng, South Africa	2008	2008	Heritage Assessment	Basic	ARM
Heritage Assessment of Rhino Mines		Thabazimbi, Limpopo Province, South Africa	2008	2008	Heritage Assessment	Impact	Rhino Mines
Cronimet Project		Thabazimbi, Limpopo Province, South Africa	2008	2008	Archaeological surveys		Cronimet
Eskom Thohoyandou SEA Project		Limpopo Province, South Africa	2008	2008	Heritage Statement		Eskom
Witbank Archaeological Assessment	Dam Impact	Witbank, Mpumalanga, South Africa	2007	2007	Archaeological survey		ARM
Sun City Archaeological Site Mapping		Sun City, Pilanesberg, North West Province, South Africa	2006	2006	Site Mapping	Recording:	Sun International
Klipriviersberg Archaeological Survey		Meyersdal, Gauteng, South Africa	2005	2006	Archaeological surveys		ARM

6 Professional Registration

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA);	270

Position	Professional Body	Registration Number
	ASAPA Cultural Resources Management (CRM) section	
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A
Member	International Association of Impact Assessors (IAIA) South Africa	5494

7 Publications

Huffman, T.N. & du Piesanie, J.J. 2011. Khami and the Venda in the Mapungubwe Landscape. *Journal of African Archaeology* 9(2): 189-206

du Piesanie, J.J., 2017. Book Review: African Cultural Heritage Conservation and Management. *South African Archaeological Bulletin* 72(205)

Heritage Impact Assessment

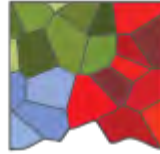
Environmental Authorisations, IWULA and Mining Right Application for the proposed
Weltevreden Mine, Mpumalanga

MBU5710



DIGBY WELLS
ENVIRONMENTAL

Appendix B: HRM Methodology



DIGBY WELLS
ENVIRONMENTAL



Cultural Significance, Field Rating and Impact Assessment

Methodology Statement

Project Number:

ZZZ9999

Prepared for:

Internal Document

June 2019

Digby Wells and Associates (South Africa) (Pty) Ltd
Co. Reg. No. 2010/008577/07. Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191. Private Bag
X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 069 6801, info@digbywells.com, www.digbywells.com

Directors: GE Trusler (C.E.O), LF Stevens, J Leaver (Chairman)*, NA Mehlomakulu*, DJ Otto
*Non-Executive



This document has been prepared by Digby Wells Environmental.

Report Type:	Methodology Statement
Project Name:	Cultural Significance, Field Rating and Impact Assessment
Project Code:	ZZZ9999

Revision History

Name	Responsibility	Version	Date
Johan Nel ASAPA Member 095	HRM Unit Manager	Ver. 1	May 2014
		Ver. 2	October 2014
		Ver. 3	May 2015
Justin du Piesanie ASAPA Member 270	Divisional Manager: Social and Heritage Services	Ver. 4	January 2016
		Ver. 5	June 2016
		Ver. 6	June 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.

TABLE OF CONTENTS

1	Introduction	1
2	Evaluation of Cultural Significance and Field Ratings.....	1
2.1	Cultural Significance Determination.....	1
2.2	Field Rating Determination	2
3	Impact Assessment Methodology	4
3.1	Categorising Impacts to Cultural Heritage	6
3.2	Impact Assessment.....	7
4	Recommended Management and Mitigation Measures	11

LIST OF FIGURES

Figure 2-2: Field Ratings Methodology.....	2
Figure 2-1: CS Determination Methodology	3
Figure 3-1: Graphical Representation of Impact Assessment Concept.....	5
Figure 3-2: Example of how Potential Impacts are considered	5

LIST OF TABLES

Table 3-1: Description of Duration, Extent, Intensity and Probability Ratings Used in the Impact Assessment.....	8
Table 3-2: Impact Significance Scores, Descriptions and Ratings.....	10
Table 3-3 Relationship between Consequence, Probability and Significance.....	10
Table 4-1: Minimum Recommended Management or Mitigation Requirements Considering CS.....	11

1 Introduction

Cultural heritage resources are intrinsic to the history and beliefs of communities. They characterise community identity and cultures, are finite, non-renewable and irreplaceable. Considering the innate value of cultural heritage resources, Heritage Resources Management (HRM) acknowledges that these have lasting worth as evidence of the origins of life, humanity and society. It is incumbent of the assessor to determine the cultural significance¹ (CS) of cultural heritage resources to allow for the implementation of appropriate management. This is achieved through assessing cultural heritage resources' value relative to certain prescribed criteria encapsulated in policies and legal frameworks, such as the South African National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

Commensurate to the NHRA, with specific reference to Section 38, this methodology aims to ensure that clients protect cultural heritage during implementation of project activities by either avoiding, removing or reducing the intensity of adverse impacts to tangible² and intangible³ cultural heritage resources within the defined area of influence.

The methodology to define CS and assess the potential effects of a project is discussed separately in the sections below.

2 Evaluation of Cultural Significance and Field Ratings

2.1 Cultural Significance Determination

Digby Wells developed a CS Determination Methodology to assign identified cultural heritage resources with a numerical CS rating in an objective as possible way and that can be independently reproduced provided that the same information sources are used, should this be required.

This methodology determines the intrinsic, comparative and contextual significance of identified cultural heritage resources by considering their:

1. Importance rated on a six-point scale against four criteria; and
2. Physical integrity rated on a five-point scale.

¹ Cultural significance is defined as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a cultural heritage resource. These attributes are combined and reduced to four themes used in the Digby Wells significance matrix: aesthetic, historical, scientific and social.

² (i) Moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls.

³ Cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

The assigned ratings consider information obtained through a review of available credible sources and representativity or uniqueness (i.e. known examples of similar resources to exist), as well as the current preservation *status-quo* as observed.

Figure 2-2 depicts the CS formula and importance criteria, and it describes ratings on the importance physical integrity scales

2.2 Field Rating Determination

Grading of heritage resources remains the responsibility of heritage resources authorities. However, the South African Heritage Resources Agency (SAHRA) Minimum Standards requires heritage reports include Field Ratings for identified resources to comply with section 38 of the NHRA. Section 7 of the NHRA provides for a system of grading of heritage resources that form part of the national estate and distinguishes between three categories.

The field rating process is designed to provide a numerical rating of the recommended grading of identified heritage resources. The evaluation is done as objectively as possible by integrating the field rating into the significance matrix.

Field ratings guide decision-making in terms of appropriate minimum required mitigation measures and consequent management responsibilities in accordance with Section 8 of the NHRA. Figure 2-1 presents the formula and the parameters used to determine the Field Ratings.

Field Rating = Average Sum of Aesthetic + Historic + Scientific + Social			
rated against			
Value	Field Rating	Designation	Authority
0	Resource not assessed	None	None
1	Resources afforded general protection in terms of Sections 34 to 37 of the NHRA and with negligible significance	Grade IV C	Local
2	Resources afforded general protection in terms of Sections 34 to 37 of the NHRA and with low significance	Grade IV B	
3	Resources afforded general protection in terms of Sections 34 to 37 of the NHRA and with medium-high significance	Grade IV A	
4	Resources afforded general protection in terms of Sections 34 to 37 of the NHRA and with high significance	Grade III B	
5	Resources afforded general protection in terms of Sections 34 to 37 of the NHRA and with very high significance	Grade II A	
6	Resources under formal protection that can be considered to have special qualities that make them significant within a province or region	Grade II	Provincial
7	Resources under formal protection that can be considered to have special qualities that make them significant within a national or international context	Grade I	National

Figure 2-1: Field Ratings Methodology

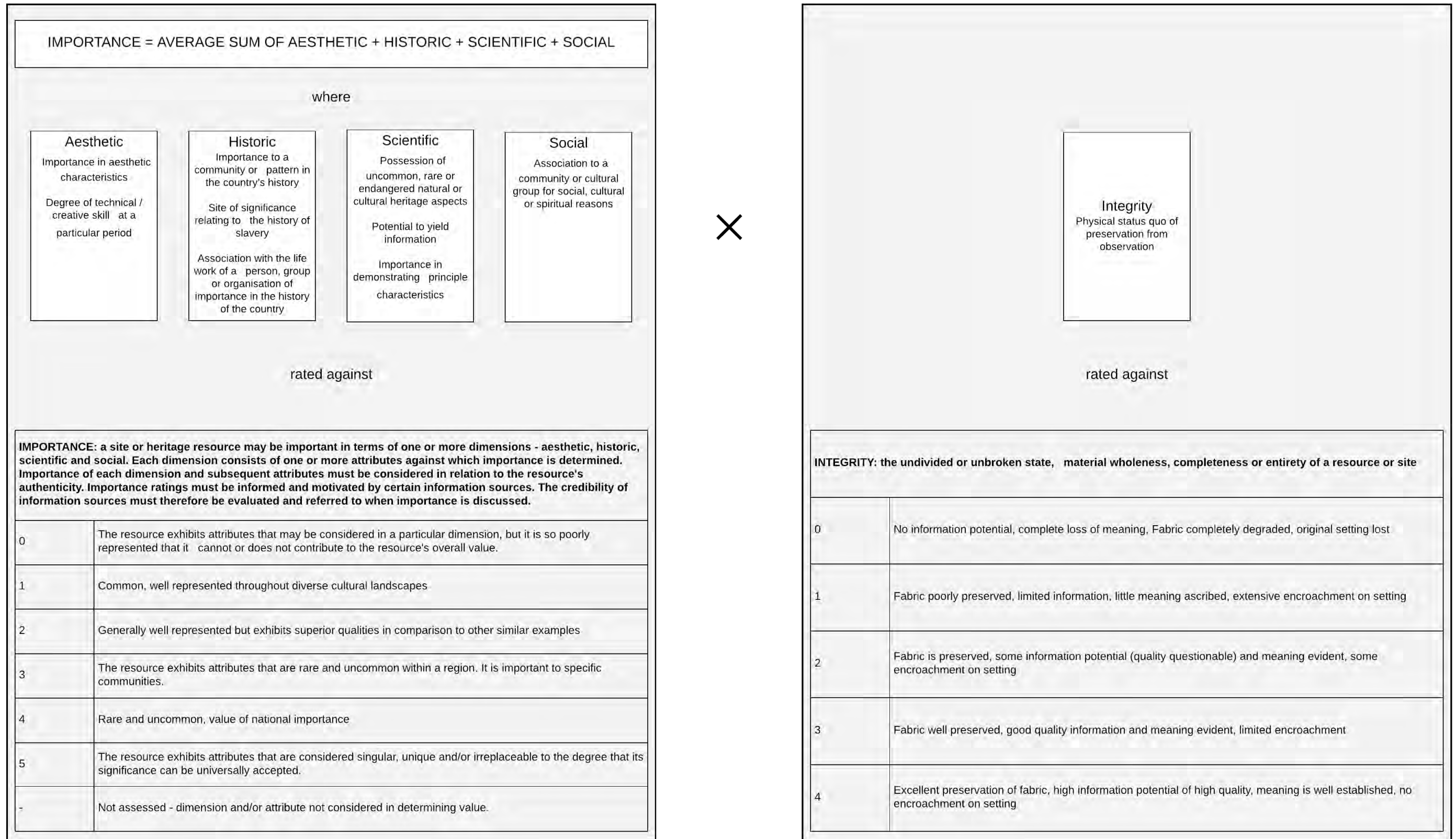


Figure 2-2: CS Determination Methodology

3 Impact Assessment Methodology

The rationale behind CS determination recognises that the value of a cultural heritage resource is a direct indication of its sensitivity to change (impacts) as well as the maximum acceptable levels of change to the resource. Therefore, the assessor must determine CS prior to the completion of any impact assessment.

These requirements in terms of international best practice standards are integrated into the impact assessment methodology to guide both assessments of impacts and recommendations for mitigation and management of resources.

The following are terms and definitions applicable to the Environmental Impact Assessment (EIA) concept (ISO 14001):

- **Project Activity:** Activities associated with the Project that result in an environmental interaction during various phases, i.e. construction, operation and decommissioning, e.g., new processing plant, new stockpiles, development of open pit, dewatering, water treatment plant;
- **Environmental Interaction:** An element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental interactions can cause environmental impacts (but may not necessarily do so). They can have either beneficial impacts or adverse impacts and can have a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change;
- **Environmental Aspect:** Various natural and human environments that an activity may interact with. These environments extend from within the activity itself to the global system, and include air, water, land, flora, fauna (including people) and natural resources of all kinds; and
- **Environmental Impact:** A change to the environment that is caused either partly or entirely by one or more environmental interactions. An environmental interaction can have either a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change. In addition, it can have either a beneficial environmental impact or an adverse environmental impact.

The assessment process identified potential issues and impacts through examination of:

- Project phases and activities,
- Interactions between activities and the environmental aspect; and
- The interdependencies between environmental aspects.

Figure 3-1 presents a graphical summary of this concept and Figure 3-2 provides an example of the process.

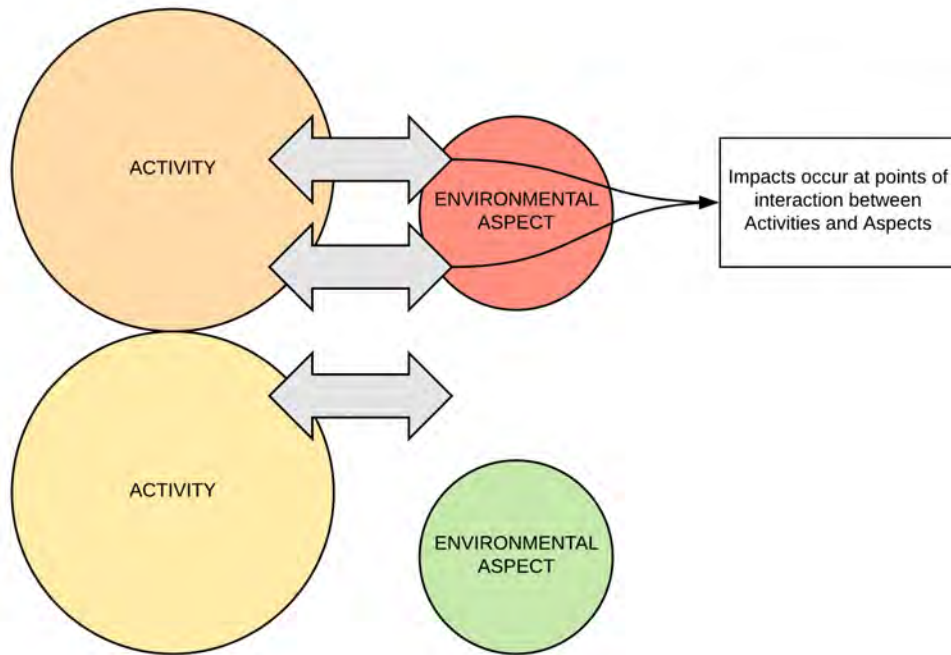


Figure 3-1: Graphical Representation of Impact Assessment Concept

Project Activity & Interaction		Environmental Aspect		Potential Environmental Impact	
Project Phase	Activity	Aspect	Interdependencies	Issue	Potential Impact
This relates to the consideration of the relevant phase of the project. Example: Construction	This refers to one or more of the activities that will be undertaken during the corresponding phase of the project. Example: Topsoil clearing	This identifies and considers the various aspects that will be affected by the project activity. Example: Heritage, Biophysical, and Social	This identifies and considers the interdependencies between the various aspects and how they may be impacted upon by the relevant activity. Example: Removal of topsoil will impact on flora which may have heritage and social implications	The issues considers the activity in relation to the identified aspects and interdependencies. Note: Activities and Aspects can have several issues resulting in various impacts. Example: Physical alteration of the land	Potential impacts are a culmination of the various categories evaluated as part of the impact assessment. Example: Topsoil clearing will remove medicinal plants that will erode indigenous knowledge systems and cultural significance.

Figure 3-2: Example of how Potential Impacts are considered



3.1 Categorising Impacts to Cultural Heritage

Impacts may manifest differently among geographical areas and diverse communities. For instance, impacts to cultural heritage resources can simultaneously affect the tangible cultural heritage resource and have social repercussions. The severity of the impact is compounded when the intensity of physical impacts and social repercussions differ significantly, e.g. removal of a grave surface dressings results in a minor physical impact but has a significant social impact. In addition, impacts to cultural heritage resources can influence the determined CS without a physical impact taking place. Given this reasoning, impacts as considered here are generally placed into three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary impacts** affect the fabric or physical integrity of the cultural heritage resource, for example destruction of an archaeological site or historical building. Direct or primary impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking. For example, the destruction of a low-density scatter of archaeological material culture may be assessed as a negatively high impact if CS is not considered;
- **Indirect, induced or secondary impacts** can occur later in time or at a different place from the causal activity, or because of a complex pathway. For example, restricted access to a cultural heritage resource resulting in the gradual erosion of its CS that may be dependent on ritual patterns of access. Although the physical fabric of the cultural heritage resource is not affected through any primary impact, its CS is affected, which can ultimately result in the loss of the resource itself; and
- **Cumulative impacts** result from in-combination effects on cultural heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
 - **Additive:** the simple sum of all the effects, e.g. the total number of development activities that will occur within the study area;
 - **Synergistic:** effects interact to produce a total effect greater than the sum of the individual effects, e.g. the effect of each different activity on the archaeological landscape in the study area;
 - **Time crowding:** frequent, repetitive impacts on a cultural heritage resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building;
 - **Neutralizing:** where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in land use could reduce the overall impact on sites within the archaeological landscape of the study area; and/or

- **Space crowding:** high spatial density of impacts on a cultural heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

The fact that cultural heritage resources do not exist in isolation from the wider natural, social, cultural and heritage landscape demonstrates the relevance of the above distinctions: CS is therefore also linked to rarity / uniqueness, physical integrity and importance to diverse communities.

3.2 Impact Assessment

The impact assessment process is designed to provide a numerical rating of the identified potential impacts. This methodology follows the established impact assessment formula:

Impact = consequence of an event x probability of the event occurring

where:

Consequence = type of impact x (Duration + Extent + Intensity)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

Type of impact = +1 (positive) or -1 (negative)

Table 3-1 presents a description of the duration, extent, intensity and probability ratings. The intensity rating definitions consider the determined CS of the identified cultural heritage resources. These criteria are used to determine the impact ratings as defined in Table 3-2 below. Table 3-3 represents the relationship between consequence, probability and significance.

The impact assessment process considers pre- and post-mitigation scenarios with the intention of managing and/or mitigating impacts in line with the EIA Mitigation Hierarchy, i.e. avoiding all impacts on cultural heritage resources. Where Project-related mitigation does not avoid or sufficiently minimise negative impacts on cultural heritage resources, mitigation of these resources may be required.

Table 3-1: Description of Duration, Extent, Intensity and Probability Ratings Used in the Impact Assessment

Value	CONSEQUENCE						PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		Probability	Description
	Probability	Description	Exposure	Description	Intensity	Description		
7	Permanent	Impact will permanently alter or change the heritage resource and/or value (Complete loss of information)	International	Impacts on heritage resources will have international repercussions, issues or effects, i.e. in context of international cultural significance, legislation, associations, etc.	Extremely high	Major change to Heritage Resource with High-Very High Value	Certain/Definite	Happens frequently. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Beyond Project Life	Impact will reduce over time after project life (Mainly renewable resources and indirect impacts)	National	Impacts on heritage resources will have national repercussions, issues or effects, i.e. in context of national cultural significance, legislation, associations, etc.	Very high	Moderate change to Heritage Resource with High-Very High Value	High probability	Happens often. It is most likely that the impact will occur.
5	Project Life	The impact will cease after project life.	Region	Impacts on heritage resources will have provincial repercussions, issues or effects, i.e. in context of provincial cultural significance, legislation, associations, etc.	High	Minor change to Heritage Resource with High-Very High Value	Likely	Could easily happen. The impact may occur.
4	Long Term	Impact will remain for >50% - Project Life	Municipal area	Impacts on heritage resources will have regional repercussions, issues or effects, i.e. in context of the regional study area.	Moderately high	Major change to Heritage Resource with Medium-Medium High Value	Probable	Could happen. Has occurred here or elsewhere
3	Medium Term	Impact will remain for >10% - 50% of Project Life	Local	Impacts on heritage resources will have local repercussions, issues or effects, i.e. in context of the local study area.	Moderate	Moderate change to Heritage Resource with Medium - Medium High Value	Unlikely / Low probability	Has not happened yet, but could happen once in a lifetime of the project. There is a possibility that the impact will occur.

Value	CONSEQUENCE						PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		Probability	Description
	Probability	Description	Exposure	Description	Intensity	Description		
2	Short Term	Impact will remain for <10% of Project Life	Limited	Impacts on heritage resources will have site specific repercussions, issues or effects, i.e. in context of the site-specific study area.	Low	Minor change to Heritage Resource with Medium - Medium High Value	Rare / Improbable	Conceivable, but only in extreme circumstances. Have not happened during the lifetime of the project, but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	Transient	Impact may be sporadic/limited duration and can occur at any time. E.g. Only during specific times of operation, and not affecting heritage value.	Very Limited	Impacts on heritage resources will be limited to the identified resource and its immediate surroundings, i.e. in context of the specific heritage site.	Very low	No change to Heritage Resource with values medium or higher, or Any change to Heritage Resource with Low Value	Highly Unlikely /None	Expected never to happen. Impact will not occur.

Table 3-2: Impact Significance Scores, Descriptions and Ratings

Score	Description	Rating
109 to 147	A very beneficial impact which 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 heritage resources.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the heritage resources.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the heritage resources.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. 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 heritage resources.	Negligible (negative)
-36 to -72	An important negative impact which 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 heritage resources.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the heritage resources and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which 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.	Major (negative)

Table 3-3 Relationship between Consequence, Probability and Significance

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

4 Recommended Management and Mitigation Measures

The CS of an identified heritage resource informs the level of the identified potential impact to that resource which in turn informs the recommended management and mitigation requirements. Table 4-1 presents an overview of the minimum recommended mitigation requirements considering the CS of the heritage resource.

Table 4-1: Minimum Recommended Management or Mitigation Requirements Considering CS

Determined CS	Minimum Management / Mitigation Requirements ⁴
Negligible	Sufficiently recorded through assessment, no mitigation required
Low	Resource must be recorded before destruction, may include detailed mapping or surface sampling
Medium	Mitigation of the resource to include detailed recording and limited test excavations
Medium-High	Project design must aim to minimise impacts; Mitigation of resources to include extensive sampling through test excavations and analysis
High	Project design must aim to avoid impacts; Cultural heritage resource to be partially conserved, must be managed by way of Conservation Management Plan
Very High	Project design must be amended to avoid all impacts; Cultural heritage resources to be conserved in entirety and conserved and managed by way of Conservation Management Plan

The desired outcome of an impact assessment is the avoidance of all negative impacts and enhancement of positive ones. While this is not always possible, the recommended management or mitigation measures must be reasonable and feasible taking into consideration the determined CS and nature of the Project.

Two categories of impact management options are considered: avoidance and mitigation.

Avoidance requires changes or amendments to Project design, planning and siting of infrastructure to avoid physical impacts on heritage resources. It is the preferred option, especially where cultural heritage resources with high – very-high CS will be impacted.

⁴ Based on minimum requirements encapsulated in guidelines developed by SAHRA

Mitigation of cultural heritage resources may be necessary where avoidance is not possible, thus resulting in partial or complete changes (including destruction) to a resource. Such resources need to be protected until they are fully recorded, documented and researched before any negative impact occurs. Options for mitigating a negative impact can include minimization, offsets, and compensation. Examples of mitigation measures specific to cultural heritage include:

- Intensive detailed recording of sites through various non-intrusive techniques to create a documentary record of the site – “preservation by record”; and
- Intrusive recording and sampling such as shovel test pits (STPs) and excavations, relocation (usually burial grounds and graves, but certain types of sites may be relocated), restoration and alteration. Any form of intrusive mitigation is normally a regulated permitted activity for which permits⁵ need to be issued by the Heritage Resource Authorities (HRAs). Such mitigation may result in a reassessment of the value of a cultural heritage resource that could require conservation measures to be implemented. Alternatively, an application for a destruction permit may be made if the resource has been sufficiently sampled.

Where resources have negligible CS, the specialist may recommend that no further mitigation is required, and the site may be destroyed where authorised.

Community consultation is an integral activity to all above-mentioned avoidance and mitigation measures.

⁵ Permit application processes must comply with the relevant Section of the NHRA and applicable Chapter(s) of the NHRA Regulations, 2000 (Government Notice Regulation [GN R] 548) and must be issued by SAHRA or the Provincial Heritage Resources Authority (PHRA) as is applicable.

Heritage Impact Assessment

Environmental Authorisations, IWULA and Mining Right Application for the proposed
Weltevreden Mine, Mpumalanga

MBU5710



DIGBY WELLS
ENVIRONMENTAL

Appendix C: PIA Report

**Palaeontological Impact Assessment for the proposed
Mine expansion on Farm Weltevreden 381, Belfast,
Mpumalanga Province**

Site Visit Report

For

Digby Wells Environmental

30 September 2019

Prof Marion Bamford

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant is: Prof Marion Bamford

Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf

Experience: 30 years research; 22 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Digby Wells Environmental, Johannesburg, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision-making process for the Project.

Specialist: Prof Marion Bamford



Signature

Executive Summary

A palaeontological Impact Assessment was requested for the proposed expansion of coal mining on a Portion of Farm Weltevreden 281, just south of Belfast. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a Phase 2 or Site Visit Palaeontological Impact Assessment (PIA) was completed for the project on 25 September 2019 and is reported herein.

The proposed site lies on the very highly palaeontologically sensitive Vryheid Formation (Ecca Group, Karoo Supergroup) that commonly has five coal seams in the Witbank Coal area. Coal is formed from the intense compression and heat alteration of peats (buried plant matter) but is of no interest palaeontologically because no original plant structure is recognisable. The shales between the coal seams often preserve impressions of fossil plants of the *Glossopteris* flora. The site visit yielded only very poorly preserved plant fragments and carbonised stems, none of which is identifiable so of new interest scientifically. There is a small chance, however, that there might be isolated pockets of well-preserved fossil impressions associated with the coal seams well below ground level so a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no palaeontological site visits are required until the geologist or responsible person finds fossil plants during the mine's operation.

Table of Contents

1.	Background	1
a.	Project background and description	1
2.	Methods and Terms of Reference	3
3.	Geology and Palaeontology	4
a.	Project location and geological context	4
4.	Palaeontological context	6
5.	Site visit observations	7
6.	Impact assessment.....	14
7.	Assumptions and uncertainties	16
8.	Recommendation.....	16
9.	References	17
10.	Chance Find Protocol	18

Table of Figures

Figure 1: Google Earth map of the proposed mine expansion at Belfast. The N4 highway runs to the northwest of the site and the R33 forms the eastern border.	3
Figure 2: Geological map of the area around Belfast and the proposed mine expansion on a portion of Farm Weltevreden 381 indicated within the yellow rectangle.....	5
Figure 3: SAHRIS palaeosensitivity maps for the site for the proposed coal mining expansion project on a portion of Farm Weltevreden 381, near Belfast, shown within the yellow rectangle.	7
Figure 4: Stop 1, close to the main entrance on the R33.	9
Figure 5: Stop 1 continued.....	10
Figure 6: Stop 2.....	11
Figure 7: Figure 7: Stop 3 in the southwest part of the Farm Weltevreden.	12
Figure 8: Travelling from Stop 3 to Stop 4 and at Stop 4.....	13

Table of Tables

Table 1: Specialist Report Requirements in terms of Appendix 6 of the EIA Regulations (2017)	1
Table 2: Explanation of symbols for the geological map and approximate ages.....	5
Table 3: GPS Points for Palaeontological Survey.....	8
Table 4: Criteria for assessing impacts.....	14
Table 5: Impact Assessment	15

Table of Appendices

Appendix A: List of Possible Fossils and Photographs

Appendix B: Details of Specialists

1. Background

To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a Phase 2 Palaeontological Impact Assessment (PIA), including a site visit, was completed for the proposed development.

a. Project background and description

The proposed site is on a portion of Farm Weltevreden 381, just south of the town of Belfast and adjacent to the existing coal mine. Currently the area is under agriculture in the central part, with fallow fields in the north and south and some patches of natural vegetation in the centre (Figure 1). Since the whole area is indicated as very highly sensitive because it lies on the Vryheid Formation (Figure 2, 3), a site visit was required for the proposed project.

A Phase 2 (site visit) Palaeontological Impact Assessment was requested for the project and was carried out by Dr Alisoun House and Mr Marc van den Brandt (PhD candidate in Paaleontology) on 25-26 September, 2019. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), the findings of the Palaeontological Impact Assessment (PIA) for the proposed development are reported herein.

Table 1: Specialist Report Requirements in terms of Appendix 6 of the EIA Regulations (2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant Section
ai	Details of the specialists who prepared the report	Appendix B
a ii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page i
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant Section
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 6
k	Any mitigation measures for inclusion in the EMPr	Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A



Figure 1: Google Earth map of the proposed mine expansion at Belfast. The N4 highway runs to the northwest of the site and the R33 forms the eastern border.

Map supplied by Digby Wells

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

- Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
- Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (as reported here);
- Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (not applicable to this assessment); and

- Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (not applicable to this assessment).

3. Geology and Palaeontology

a. Project location and geological context

The site is in the northeastern corner of the Witbank Coal Field and has at least five coal seams preserved underground (Snyman). There is an established mine adjacent to the area for the proposed expansion so it is well known that there are coal reserves. The sediments are the shales, mudstones, sandstones and coal seams of the Vryheid Formation (Ecca Group, Karoo Supergroup) that lie on the uneven topography of the base of the Karoo Basin so the presence and thickness of the various strata is variable and unpredictable without the evidence of core material (Snyman, 1998). Quaternary alluvium and soils cover much of the rocks, and there are outcrops of Jurassic dolerite dykes in the region, as well as older diabase (dolerite) intrusions (Figure 2).

Abbreviations of the rock types are explained in Table 2. In this table, 'SG' refers to Supergroup, 'Fm' refers to Formation and 'Ma' refers to 'million years'. Cells shaded grey highlight the formations impacted by the Project.

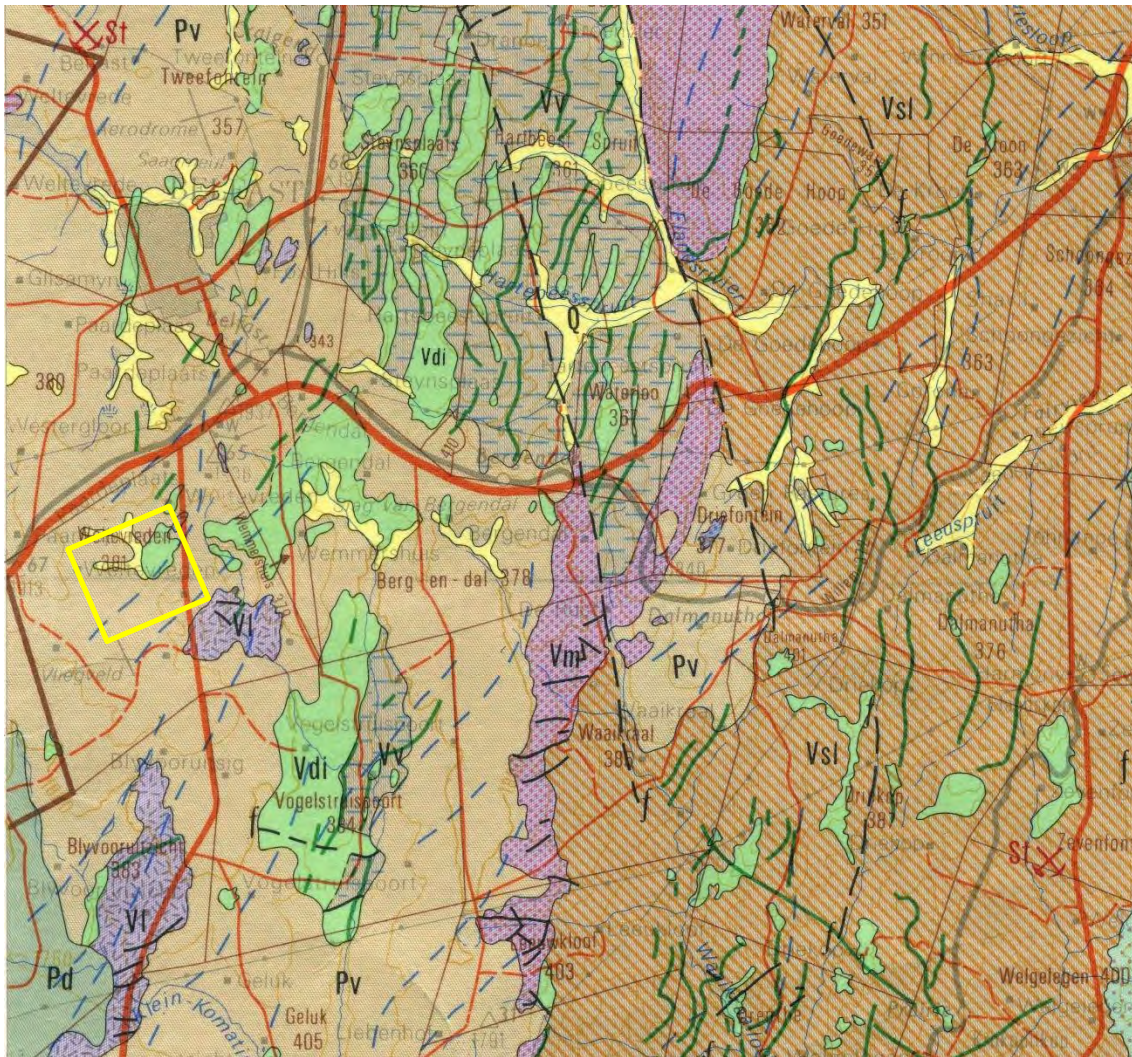


Figure 2: Geological map of the area around Belfast and the proposed mine expansion on a portion of Farm Weltevreden 381 indicated within the yellow rectangle.

Map enlarged from the Geological Survey 1: 250 000 map 2530 Barberton.

Table 2: Explanation of symbols for the geological map and approximate ages

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 25 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal	Lower Permian, Middle Ecca
Pd	Dwyka Group, Karoo SG.	Diamictites, tillites, mudstones	Late Carboniferous to Early Permian
Vdi	Diabase	Intrusive rocks	Post 2050 Ma

Symbol	Group/Formation	Lithology	Approximate Age
VI	Lakenvalei Fm, Pretoria Group, Transvaal SG	Sandstones	Ca 2100 Ma
Vv	Vermont Fm, Pretoria Group, Transvaal SG	Mudrock, tuffaceous in areas	Ca 2100 Ma
Vsl	Lydenburg Member, Silverton Fm, Pretoria group, Transvaal SG	Tuffs	Ca 2150 Ma

(Erikssen et al., 2006. Johnson et al., 2006; McCarthy et al., 2006; Robb et al., 2006; van der Westhuizen et al., 2006).

4. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 3. The site for development is in Vryheid Formation (Ecca Group, Karoo Supergroup) with a small outcrop of Quaternary alluvium and ancient diabase in the northern part. Only the Vryheid Formation is potentially fossiliferous as it contains coal seams. Although the coal itself does not contain any fossil plants of the *Glossopteris* flora because they have been highly modified by temperature and pressure to form coals, the shale lenses between the coal lenses can contain impressions of the *Glossopteris* flora, for example, *Glossopteris* leaves, seeds, roots and reproductive structures, ferns, sphenophytes, lycopods and some early gymnosperms.

In the Belfast area the uppermost coal seam, No 5, is on average 12m below the ground surface. It is overlain by about 10m of soil, then a layer of shale and sandstone (Snyman, 1998).

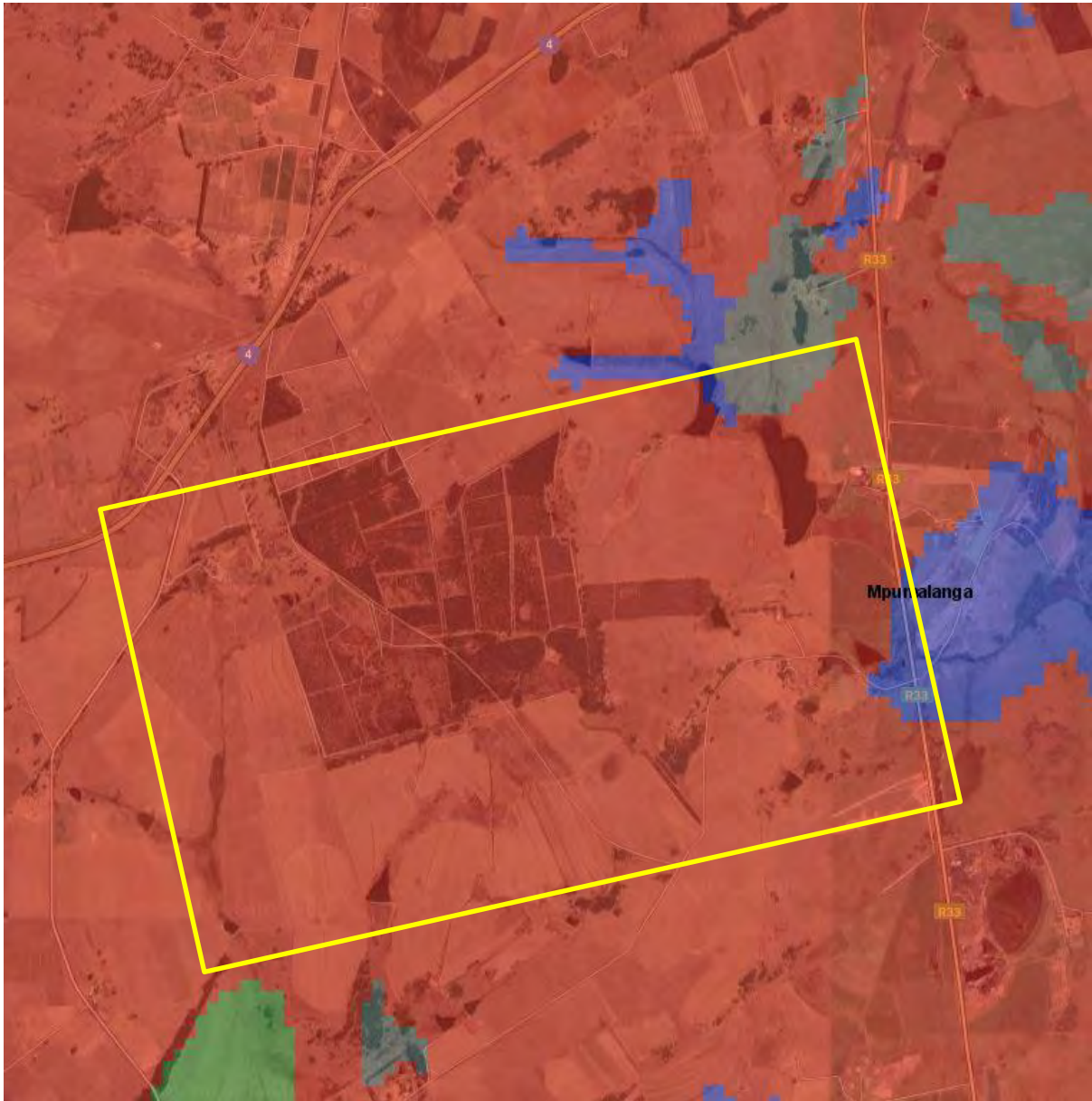


Figure 3: SAHRIS palaeosensitivity maps for the site for the proposed coal mining expansion project on a portion of Farm Weltevreden 381, near Belfast, shown within the yellow rectangle.

Colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

5. Site visit observations

The site was visited by Dr Alisoun House and Mr Marc van den Brandt on 25th September and they surveyed the area, much of which is still agricultural land but the rocks below the soils were exposed where test trenches had been dug and new roads had been made. Four sites or stops were documented as being representative of the region and are described below with the photographs taken by them produced in Figures 4-8 below.

Table 3: GPS Points for Palaeontological Survey

GPS coordinates	Observations	Figure
<p>Stop 1 S 25° 46.500' E 30° 02.516'</p>	<p>Point is near the Visitors Car Park, near South Eastern corner of farm, immediately west of the tarred road R33.</p> <p>There are loose piled up rocks, as a result of gravel road works, of two kinds: 1) black/dark grey shale, and 2) lighter, white to beige sandstone/quartzite. Poorly preserved fragments of fossils occur only in the black/dark grey shale: branch or thick stem compressed, glassy black, 4 cm wide, 20 cm long (Fig 4d).</p> <p>Several thinner stem impressions, 8 mm wide, 15-20 cm long, straight, some forming "Y" shapes (Fig 5a)</p> <p>Trace fossils: "Raindrops", large, 1 cm wide, round, shallow depressions that are chemical concretions (Fig 4b).</p>	4, 5
<p>Stop 2 S 25° 46.497' E 30° 02.469'</p>	<p>Point is very near Stop 1 above, only about 100 m away</p> <p>Loose pile of rocks as a result of gravel road works, of two kinds: 1) black/dark grey shale, and 2) lighter, white to beige sandstone/quartz.</p> <p>No fossils or trace fossils</p>	6
<p>Stop 3 S 25° 46.527' E 30° 01.973'</p>	<p>Point is near South Western corner of Farm, about 700m from Stops 1 and 2.</p> <p>Disturbed loose piles of rocks, the result of road works, creating long piles either side of the gravel road.</p> <p>Compressed carbonaceous stems, unidentifiable, occur in black/dark grey shale – see Fig 4d.</p> <p>In situ exposures of shale in road, immediately below the level of the road – see photos with hammer for scale.</p>	7
<p>En route to northwest part of farm</p>	<p>Farmland and exotic trees. No fossils</p>	8a
<p>Stop 4 S 25° 45.199 E 30° 02.283</p>	<p>Point is near North Eastern corner of Farm, about 2 km away from Stops 1 and 2, immediately west of the tarred road R33, near a northern-most small house/farmers workers homes.</p> <p>Naturally occurring loose piles of orange/red weathered (or black and white speckled diabase boulders, hundreds of boulders, randomly scattered over hundreds of square meters</p> <p>No fossils/trace fossils</p>	8c-d

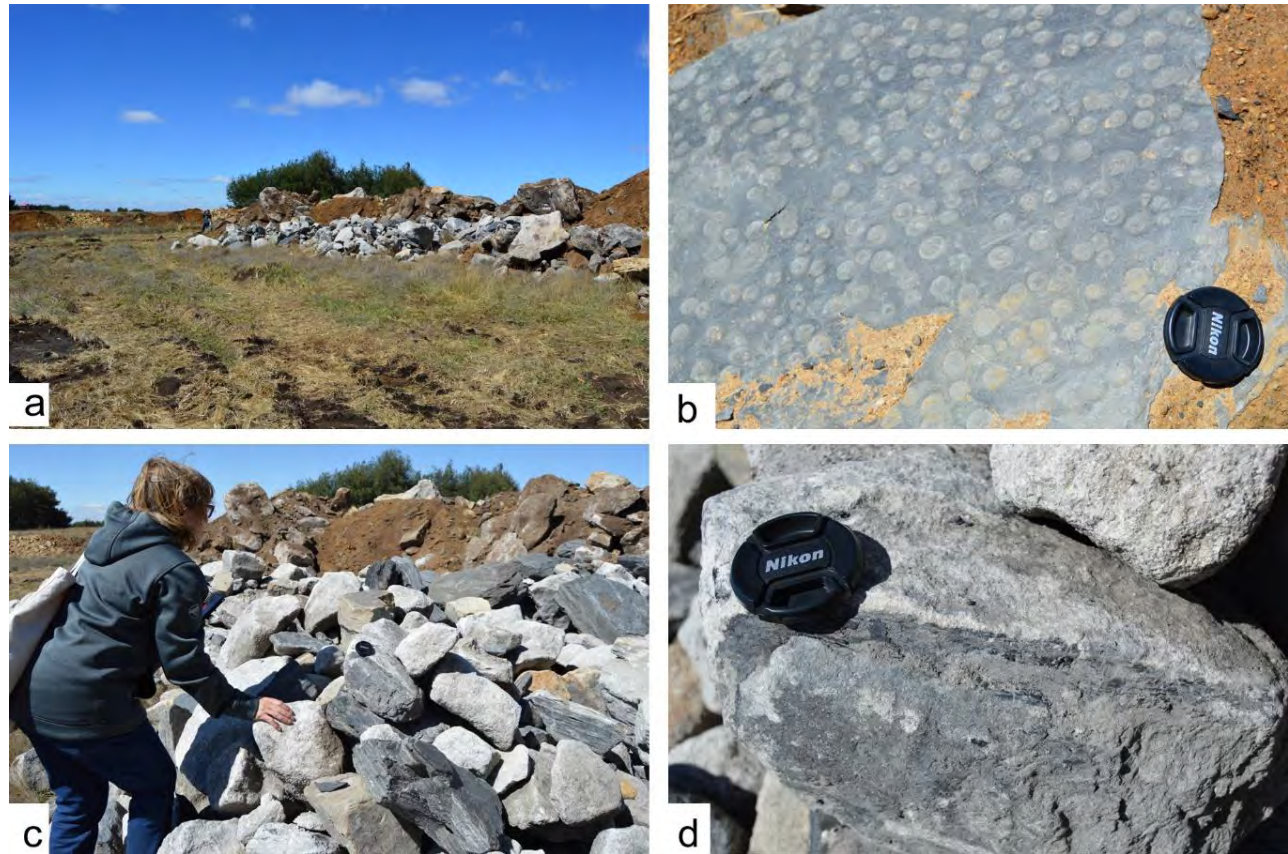


Figure 4: Stop 1, close to the main entrance on the R33.

A – piles of rubble from earlier excavations, b – chemical nodules in the shale, c – close up of the rubble comprising dark grey shale and lighter grey sandstones, d – carbonised plant material. This might have been a stem but it has been severely altered and in is not recognisable.

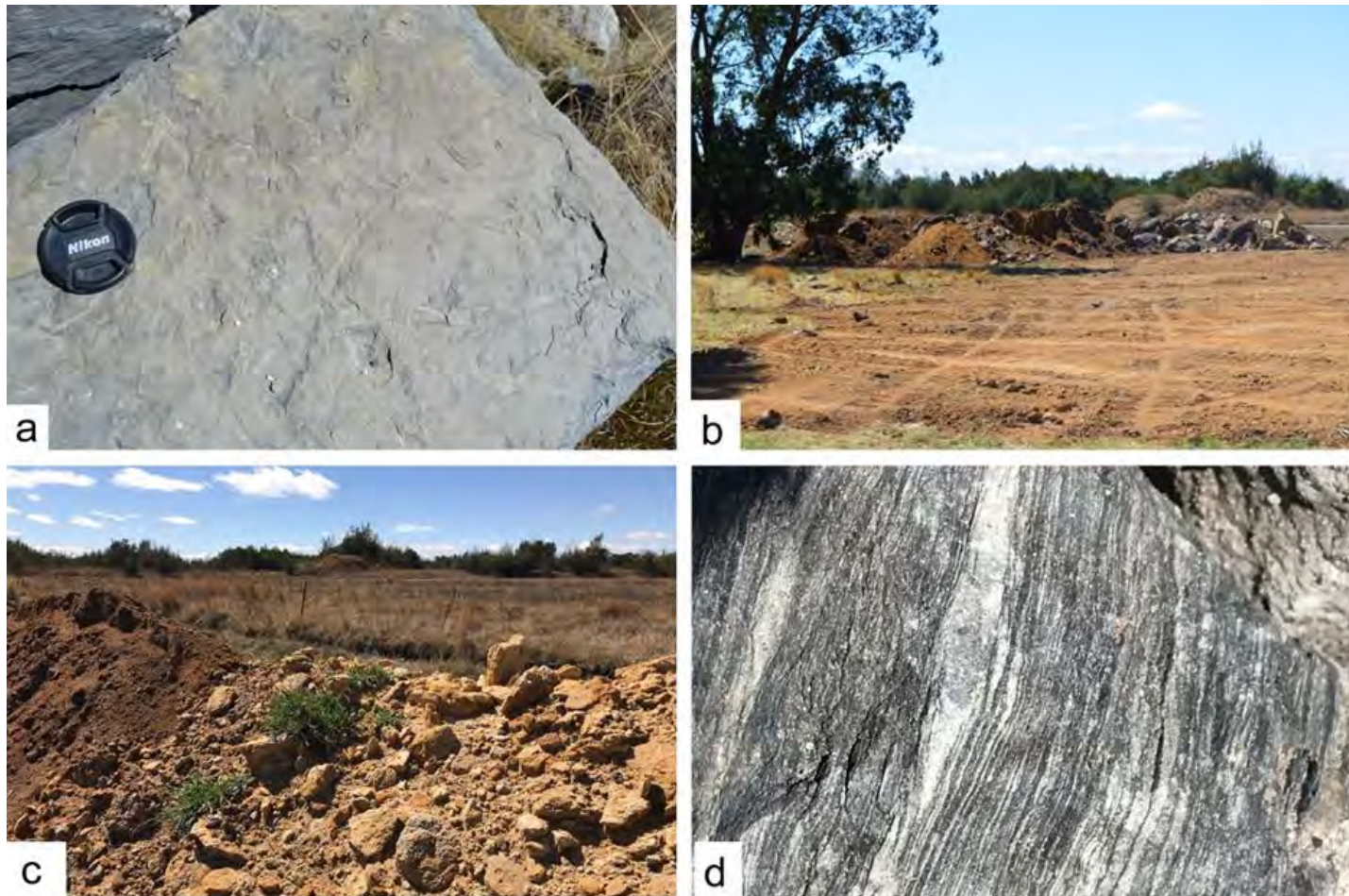


Figure 5: Stop 1 continued

a – faint plant fragment impressions on some pieces of shale. Lens cap diameter = 5cm. b- view of another dump near stop 1, c – view of a trench, exposing shales and boulders only. D – fine striations in some of the shales.



Figure 6: Stop 2

a – view of old dumps of sandstone and shales with the mine in the background, b – sandstone boulders and shale blocks, c – new mine road cut into the soils, d – agricultural land that will be mined for coal.



Figure 7: Stop 3 in the southwest part of the Farm Weltevreden.

a – pile of rubble comprising shales and sandstones, b – close-up showing a possible carbonised stem that has been completely altered by high pressure and temperatures, c – in situ shales in the graded roads, d – dark grey laminated shales but without any fossils.

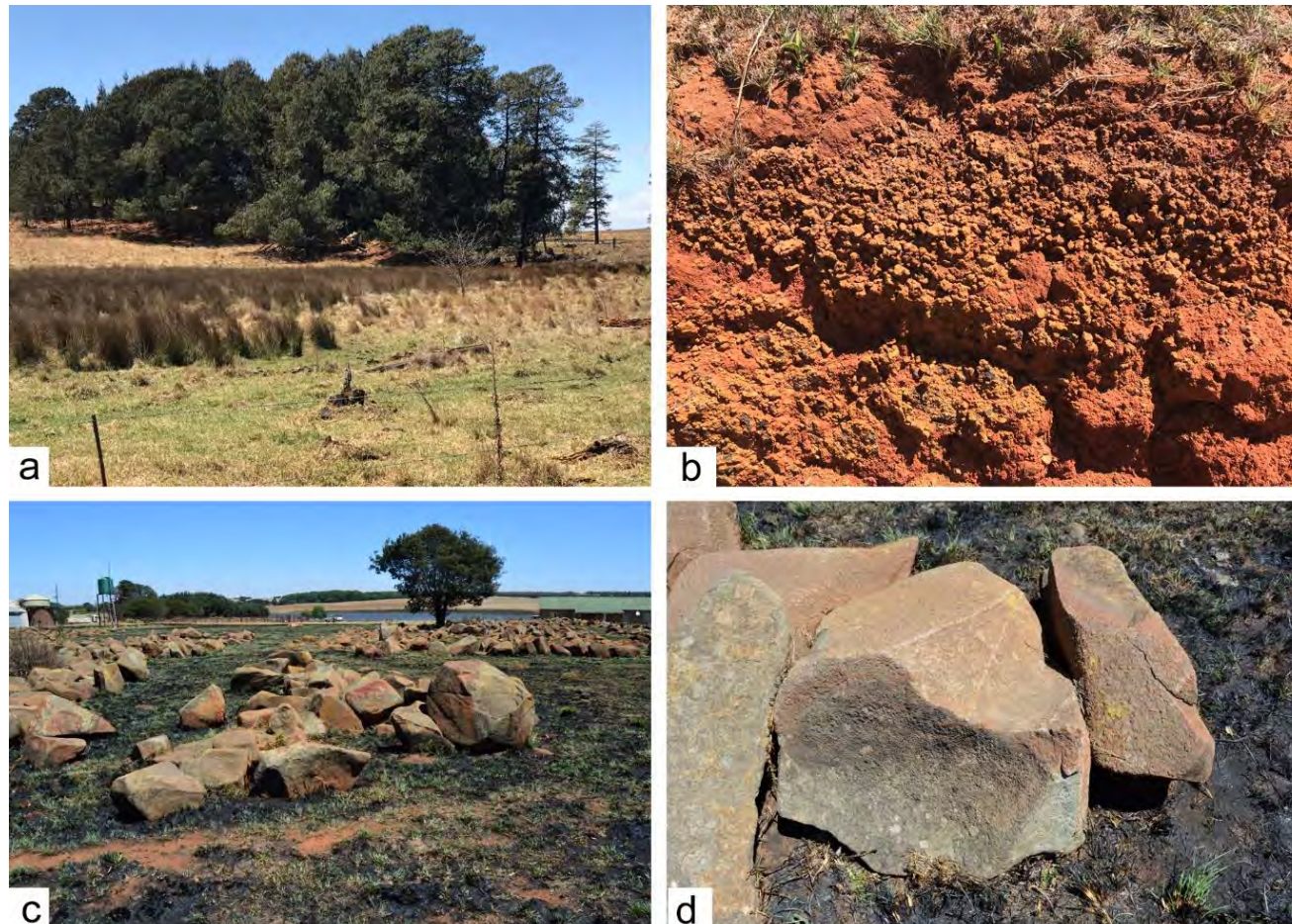


Figure 8: Travelling from Stop 3 to Stop 4 and at Stop 4

A = agricultural land between Stops 3 and 4. B – laterite nodules in the soil profile, possibly Quaternary. C – Diabase or dolerite boulders exposed near the farm house at Stop 4. E – close-up of the coarse-grained dolerite.

6. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in **Error! Reference source not found.**:

Table 4: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 5: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	H	-
	M	-
	L	Soils and dolerite (diabase) do not preserve plant fossils; so far there are no records from the Vryheid formation of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. Fragmentary but unrecognisable carbonised stems and plant impressions were seen only at Stop 1. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	Since only the possible fossils within the area would be fossil plants from the <i>Glossopteris</i> flora in the shales, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the soils. The exposed shales and sandstones had only very poor fragmentary plants; they are rare and sporadic so a Fossil Chance Find protocol should be added to the eventual EMPr.

Based on the nature of the project and observations in the field, surface activities will not impact upon the fossil heritage. Fossils are likely to be found associated with the coal seams well below ground. The near surface shales only have very poorly preserved fossil plant

impression that are unrecognisable. The distribution of fossil plants in the Vryheid Formation is known to be sporadic and unpredictable. No fossil vertebrates occur with the *Glossopteris* plants as they require different conditions of preservation. Since there is a small chance that fossils from the Vryheid Formation may be disturbed a Fossil Chance find protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

7. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, and the observations from the site visit, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, material. The quality, however, is too poor to be of scientific interest. We do not know if there is well-preserved material below ground.

8. Recommendation

Based on experience and the site observations there are no good fossils near the surface, but there may be some below the surface and associated with the other coal seams BUT their occurrence and distribution is unknown. There is a small chance that fossil plants may occur in the adjacent shales of the early Permian Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMP: if fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

9. References

- Anderson, J.M., Anderson, H.M., 1985. Palaeoflora of Southern Africa: Prodrumus of South African megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. 423 pp.
- Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.
- Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.
- Snyman, C.P., 1998. Coal. In: Wilson, M.G.C., and Anhaeusser, C.P., (Eds) The Mineral Resources of South Africa: Handbook, Council for Geosciences 16, 136-205.

10. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations and mining activities begin.

1. The following procedure is only required if fossils are seen on the surface and when excavations/mining commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the mining activities will not be interrupted.
3. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 9). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix A: List of Possible Fossils and Photographs

List of Possible Fossils

Plant group – Vryheid Fm	Genus and Species
Sphenophytes (horsetails)	<i>Sphenophyllum speciosum</i>
	<i>Raniganjia kilburnensis</i>
	<i>Phyllotheca australis</i>
	<i>Phyllotheca lawleyensis</i>
	<i>Phyllotheca wetensis</i>
	<i>Schizoneura gondwanensis</i>
Ferns	<i>Sphenopteris lobifolia</i>
Glossopterids	<i>Plumsteadia natalensis</i>
	<i>Plumsteadia gibbosa</i>
	<i>Estcourtia vandijkii</i>
	<i>Estcourtia bergvillensis</i>
	<i>Rigbya arberioides</i>
	<i>Lidgettonia africana</i>
	<i>Lidgettonia mooiriverensis</i>
	<i>Lidgettonia inhluzanensis</i>
	<i>Lidgettonia lidgettonioides</i>
	<i>Lidgettonia elegans</i>
	<i>Glossopteris symmetrifolia</i>
	<i>Glossopteris loskopensis</i>
	<i>Ottokariaceae</i>
	<i>Lidgettoniaceae</i>
Incertae sedis	<i>Noeggerathiopsis hislopi</i>
	<i>Pagiophyllum vandijkii</i>
	<i>Taeniopteris estcourtiana</i>
	<i>Benlightfootia mooiensis</i>



Selection of fossil plant impressions of the *Glossopteris* flora

Appendix B: Details of Specialists

Curriculum vitae (short) - Marion Bamford PhD

September 2019

I) Personal details

Surname : **Bamford**
First names : **Marion Kathleen**
Present employment : Professor; Director of the Evolutionary Studies Institute.
Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-
Telephone : +27 11 717 6690
Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016

SASQUA (South African Society for Quaternary Research) – 1997+
 PAGES - 2008 –onwards: South African representative
 ROCEEH / WAVE – 2008+
 INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/completed	Current
Honours	7	0
Masters	10	4
PhD	12	5
Postdoctoral fellows	10	3

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year
 Biology III – Palaeobotany APES3029 – average 25 students per year
 Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology;
 Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor
 Guest Editor: *Quaternary International*: 2005 volume
 Member of Board of Review: *Review of Palaeobotany and Palynology*: 2010 –
Cretaceous Research: 2014 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells

- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO

xi) Research Output

Publications by M K Bamford up to June 2018 peer-reviewed journals or scholarly books: over 135 articles published; 5 submitted/in press; 8 book chapters.

Scopus h index = 26; Google scholar h index = 30;

Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)

Alisoun Valentine House

084 5870023

alisoun.house@wits.ac.za

KEY SKILLS AND ATTRIBUTES

- The stamina and ability to work effectively under pressure.
- Highly developed social and interpersonal skills.
- Good communication skills, both oral and written.
- The ability to be creative and innovative and to find workable strategies to achieve stated aims.
- Excellent organisational skills.
- The ability to analyse situations, behaviour and thinking and respond with patience and understanding.
- Research and scientific writing.

WORK HISTORY

Postdoc Fellow – Evolutionary Studies Institute

January 2019 – December 2019

January 2018 – December 2018

January 2017 – December 2017

Analysis of archaeological charcoal from an Middle Stone Age and Early Iron Age sites

Host: Professor Marion Bamford

Sessional position – School of Animal, Plant and Environmental Sciences

March 2016 – November 2016

Academic support for postgraduate students

Short term internship – University of the Witwatersrand

August – November 2015

Assistant to Editor for 'Flora of the Witwatersrand' – University of the Witwatersrand

September 2008 – February 2010

Assisted with editing and preparing the Flora for publication

Tutor at the College of Science – University of the Witwatersrand

Academic years 2000 – 2003

Responsibilities included teaching general biology to first and second year students in the College of Science; as well as marking essays and assignments.

P.A. to Director/Manager of Cowling Davies (Small Advertising/Design Studio)

April 1992 – December 1992

Responsibilities included reception work; office administration; preparation of quotations; booking media advertisements and general assistance.

Herbarium Technician - University of the Witwatersrand

October 1991 – March 1992

Responsibilities included identification, pressing and mounting of plant specimens; capturing and maintaining data in the Herbarium computer system; maintaining the collection; filing; acting as librarian for the reference book collection and assisting students with research.

EDUCATION

Doctor of Philosophy (PhD) University of the Witwatersrand (2015)

Title: Systematic Applications of Pollen Grain Morphology and Development in the Acanthaceae

Supervisor: Professor Kevin Balkwill

Master of Science (MSc) University of the Witwatersrand (1991)

Title: A developmental study of *Nephroselmis viridis* (Inouye, Suda et Pienaar) Prasinophyceae

Supervisor: Professor Richard Pienaar

Degree awarded with Distinction.

Bachelor of Science with Honours (B.Sc. Hon.) University of the Witwatersrand (1987)

Awarded the Florence D. Hancock prize for a Dissertation in Phycology (1988)

Higher Diploma in Education (Postgraduate) for Secondary Education

University of the Witwatersrand (1985)

Teaching subjects: Biology and Science

Bachelor of Science (B.Sc.) University of Witwatersrand (1984)

Major: Botany

Sub-majors: Microbiology and Zoology

Matriculation Certificate Hyde Park High School (1979)

Subjects passed: English, Afrikaans, Biology, Mathematics, Geography, Home Economics

PUBLICATIONS

Young A.V. and Pienaar R.N. 1989. The ultra structure of a new species of *Nephroselmis* (Prasinophyceae). Proceedings of the Electron Microscopy Society of Southern Africa. 19: 113–114.

House A. and Balkwill K. 2013. FIB-SEM: An Additional Technique for Investigating Internal Structure of Pollen Walls. *Microscopy & Microanalysis* 19: 1535–1541.

House A. and Balkwill K. 2014. FIB-SEM: A new technique for investigating pollen walls. *Microscopy: advances in scientific research and education* (A. Méndez-Vilas, Ed.) 1: 54–58.

© FORMATEX.

House A. and Balkwill K. 2016. Labyrinths, columns and cavities: new internal features of pollen grain walls in the Acanthaceae detected by FIB-SEM. *Journal of Plant Research* 129: 225–240.

House A. and Balkwill K. 2017. FIB-SEM enhances the potential taxonomic significance of internal pollen wall structure at the generic level. *Flora-Morphology, Distribution, Functional Ecology of Plants* 236–237C: 44–57.

House A. 2017. FIB-SEM: a new method for examining pollen grain walls and palaeontological specimens in 3D. Proceedings of the 21st diennial conference of the South African Society of Quaternary Research. *Palaeontologia Africana*, 52:21–22. ISSN 2410-4418.

House A. and Balkwill K. 2019. Development and expansion of the pollen wall in *Barleria obtusa* Nees (Acanthaceae). South African Journal of Botany 125: 188–195.

House A. and Bamford M.K. 2019. Investigating the utilisation of woody plant species at an Early Iron Age site in KwaZulu-Natal, South Africa, by means of identifying archaeological charcoal. Archaeological and Anthropological Sciences. (In Press).

Irene Esteban, Marion K. Bamford, Charlotte S. Miller, Frank H. Neumann, Enno Schefuß, Alisoun House, Justin Pargeter, Hayley C. Cawthra, Erich C. Fisher. Palaeoenvironments of hunter-gatherers from MIS 3 to the Holocene 1 in coastal Pondoland (South Africa): a biochemical and palaeobotanical approach. Quaternary Research (Submitted September 2019).

McCullum DA, House AV, Balkwill K (Eds).The Flora of the Witwatersrand. (Vol. 2). Dicotyledons – Piperaceae to Ebenaceae. NiSC. IN PRESS, (Publishing date-December 2019).

McCullum DA, House AV, Balkwill K (Eds).The Flora of the Witwatersrand. (Vol. 3). Dicotyledons – Oleaceae to Compositae. NiSC IN PRESS, (Publishing date-December 2019).

House A. and Bamford M.K. Furnaces, hearths, rituals and construction: investigating the utilisation of woody plant species at an Early Iron Age site by means of identifying archaeological charcoal. (In Preparation).

PALAEONTOLOGICAL IMPACT FIELD EXPERIENCE

May 2018 – SARAO Williston and Carnarvon for Digby Wells

August 2019 – Idlanga Coal MR, Rietvlei, Vryheid area – Digby Wells

September 2019 – Schmidtsdrift PR for Thaya Environmental Specialist

September 2019 – Estcourt Pvt Hospital for EnviroPro

September 2019 – Vulindlela BWS for Ksems

MARC JOHAN VAN DEN BRANDT

CURRICULUM VITAE

01 October 2019

Personal Details

Name	Marc Johan Van den Brandt
Cell	(+27) (0) 84 5272 832

Education

01/2017	-	In progress:
01/2015	-	Master of Science Degree at the University of the Witwatersrand
01/2013	-	Bachelor of Science Honours Degree at the University of the
01/2002	-	Bachelor of Commerce Honours Degree at Rhodes University
01/1998	-	Bachelor of Commerce Degree at Rhodes University
12/1997		Senior Certificate (Grade 12) at Fairmont High School, Durbanville, Western Cape

Palaeontological Conference Presentations

Palaeontological Society of Southern Africa (PSSA), 19th Biennial Conference, Stellenbosch, South Africa, 5-9 July 2016	CRANIAL MORPHOLOGY OF EMBRITHOSAURUS SCHWARZI (PARAREPTILIA, PAREIASAURIA), AND A TAXONOMIC AND STRATIGRAPHIC REASSESSMENT OF THE SOUTH AFRICA MIDDLE PERMIAN PAREIASAURS
Palaeontological Society of Southern Africa (PSSA), 20th Biennial Conference,	UNDERSTANDING MIDDLE PERMIAN PAREIASAUR DIVERSITY: THE CRANIAL MORPHOLOGY OF NOCHELESAURUS ALEXANDERI AND EMBRITHOSAURUS SCHWARZI

Bloemfontein, South Africa, 4-7 July 2018	
Centre of Excellence (COE) 5 year anniversary Lecture Series (29-31 August 2018, Gauteng)	UNDERSTANDING MIDDLE PERMIAN PAREIASAUR DIVERSITY: THE CRANIAL MORPHOLOGY OF NOCHELESAURUS ALEXANDERI AND EMBRITHOSAURUS SCHWARZI
Society of Vertebrate Palaeontology (SVP), 75th Annual Conference, 17-21 October 2018, Albuquerque, USA	UNDERSTANDING MIDDLE PERMIAN PAREIASAUR DIVERSITY: THE CRANIAL MORPHOLOGY OF NOCHELESAURUS ALEXANDERI AND EMBRITHOSAURUS SCHWARZI

Palaeontological Field Work experience

2019	<ul style="list-style-type: none"> 24 Feb – 10 Mar: Laingsberg & Victoria West (Jasfontein, Nobelsfontein). Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 40 skulls found.
2018	<ul style="list-style-type: none"> 29 Feb – 9 Mar: Laingsberg. Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 16 skulls found.
2017	<ul style="list-style-type: none"> 27 Feb – 14 Mar: Merweville Deesveesfontien. Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 20 skulls found. 15-22 May: Sutherland. Karoo Supergroup, middle Permian, Albany museum Grahamstown palaeobotanical collecting field trip. Hosted by Dr. Rose Prevec.
2016	<ul style="list-style-type: none"> 28 Feb – 13 Mar: Laingsberg. Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 8 skulls found. 18-27 Sep: Sutherland. Karoo Supergroup, middle Permian, Albany museum Grahamstown palaeobotanical collecting field trip. Hosted by Dr. Rose Prevec. New Permian insect species found, dozens leaves found.
2015	<ul style="list-style-type: none"> 6-8 Feb: Jagersfontein. Karoo Supergroup, late Permian, fossil collecting field trip for PhD research of Dr. Pia Viglietti. 8 skulls found. 22 Feb – 6 Mar: Renostervalley Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 20 skulls found. 10-19 Nov: Karoo, Beaufort group, late Permian, Iziko South African museum collecting field trip. Hosted by Roger Smith. 10 skulls found.

2014	<ul style="list-style-type: none"> • 26 Feb – 13 Mar: Muggfontein. Karoo Supergroup, middle Permian, ESI annual collecting field trip. Hosted by Prof Bruce Rubidge. 10 skulls found. • 8-23 Sep: Karoo Supergroup, late Permian, fossil collecting field trip for PhD research of Dr. Pia Viglietti. 10-15 skulls found.
2013	<ul style="list-style-type: none"> • 12-15 May: University of the Witwatersrand Honours Degree Field trip of the entire Karoo Supergroup sequence. Hosted by Prof Bruce Rubidge. • 1-4 Sep: University of the Witwatersrand Honours Degree Field trip of the Stormberg sequence (Dinosaur deposits) Hosted by Prof Jonah Choinere. • 9-23 Nov: Science Tent, primary fossil cataloguer for Homo Naledi new hominid discovery, Rising Star Cave, Cradle of Humankind, Gauteng. Catalogued 1200 new hominid fossils. Hosted by Prof Lee Burger.

Publication List

ISSN/ISBN Number	1432-1904
Title of Article	Physiological implications of the abnormal absence of the parietal foramen in a Late Permian cynodont (Therapsida)
Title of Journal	The Science of Nature, Naturwissenschaften
Volume	December 2015, 102:69
Authors	Benoit,J., Abdala,F., Van den Brandt,M.J., Manger,P.R., and Rubidge,B.S.
Status	Published online in 2015.
Year	2015
Web Address	http://link.springer.com/article/10.1007%2Fs00114-015-1321-4

ISSN/ISBN Number	ISSN 2410-4418 Palaeont. afr. (2018) 52: 201–221
------------------	--

Title of Article	Cranial morphology and phylogenetic analysis of <i>Cynosaurus suppostus</i> (Therapsida, Cynodontia) from the Upper Permian of the Karoo Basin, South Africa
Title of Journal	Palaeontologia africana
Volume	52, 2017-2018
Authors	Van den Brandt,M.J., and Abdala,F.
Status	Published online 27 March 2018
Year	2018
Web Address	https://hdl.handle.net/10539/24254

ISSN/ISBN Number	10.1093/zoolinnean/zlz064
Title of Article	Cranial morphology and phylogenetic relationships of the Middle Permian pareiasaur <i>Embrithosaurus schwarzi</i> from the Karoo Basin of South Africa.
Title of Journal	Zoological Journal of the Linnean Society
Authors	Van den Brandt,M.J., Rubidge,B.S. and Abdala,F.
Status	Accepted by the journal on 12 July 2019.

References

Professor Bruce Rubidge	Director- DST-NRF Centre for Excellence in Palaeosciences (CoE-Pal) Office : +27 11 717 6685 Mobile +27 72 575 7752 Fax +27 11 717 6694 E-mail: bruce.rubidge@wits.ac.za
Professor Fernando Abdala	Unidad Ejecutora Lillo, CONICET-Fundación Miguel Lillo, Miguel Lillo 251, Tucumán, Argentina. E-mail: nestor.abdala@wits.ac.za
Doctor Julien Benoit	Senior Researcher, Evolutionary Studies Institute (ESI), University of the Witwatersrand, Johannesburg Office : +27 11 717 6687 Mobile +27 79 789 6503 Fax +27 11 717 6694 E-mail: julien.benoit@wits.ac.za