DIGBY WELLS
ENVIRONMENTAL

SAHRIS Case ID: 12104

Basic Assessment and Environmental Management Plan for the proposed pipeline from the Mbali Colliery to the Tweefontein Water Reclamation Plant, Mpumalanga Province

Heritage Basic Assessment Report

Project Number:

HCI4929

Prepared for:

HCI Coal (Pty) Ltd (Mbali Colliery)

January 2018

Digby Wells and Associates (South Africa) (Pty) Ltd
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This document has been prepared by Digby Wells Environmental.

Report Type:	**Heritage Basic Assessment Report**
Project Name:	**Basic Assessment and Environmental Management Plan for the proposed pipeline from the Mbali Colliery to the Tweefontein Water Reclamation Plant, Mpumalanga Province**
Project Code:	**HCI4929**

Name	Responsibility	Signature	Date
Shannon Hardwick Heritage Resources Management: Intern ASAPA Member: 451	Report Compilation		January 2018
Justin du Piesanie Manager: HRM ASAPA Member 270	Pre-disturbance survey; Technical Review		January 2018
Lelani Stolp	Project Management		January 2018

EXECUTIVE SUMMARY

Digby Wells Environmental (hereinafter Digby Wells) are providing specialist services to Mbali Coal (Pty) Ltd (hereinafter Mbali Coal), a wholly-owned subsidiary of HCI Coal (Pty (Ltd) (hereinafter HCI Coal). Mbali Coal is proposing and undergoing the Environmental Authorisation (EA) application process for a new water pipeline between the Mbali Colliery and Tweefontein Water Reclamation Plant (TWRP) [*operated by Glencore Operations South Africa (Pty) Ltd*] ("the Project"). The EA application is being undertaken in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended).

The aim of the specialist heritage study was to conduct a Heritage Resources Management (HRM) Process in support of the EA application for the construction and operation of the Mbali-TWRP Pipeline. Digby Wells completed the necessary Basic Assessment (BA) process and Environmental Management Plan (EMP) in support of EA application in accordance with GN R 983 (as amended) Appendix 1 Subsections 2(d), 3(1)(h)(iv) and (vii) and Section 38(8) of the National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA).

The following activities were completed:

- Description of the predominant cultural landscape supported through secondary and primary data collection;
- Undertaking historical layering to identify potential structures older than 60 years that are protected under Section 34 of the NHRA, or any other tangible heritage resources;
- Assessment of the Cultural Significance (CS) of identified heritage resources;
- Identification of potential impacts to heritage resources based on Project-related activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that result from the Project;
- Recommending feasible management or mitigation measures to avoid and/or minimise negative impacts and enhance potential benefits; and
- Submission of the Heritage Basic Assessment Report (HBAR) to the South African Heritage Resources Agency (SAHRA) and the Mpumalanga Provincial Heritage Resources Agency (MPHRA) for Statutory Comment as required under Section 38(8) of the NHRA.

The proposed pipeline is underlain by the palaeontologically-sensitive layers of the *Vryheid Formation*. The project will include underground and above-ground portions and is understood to have superficial disturbance to the surface. There is therefore no foreseen impact to this resource. The pre-disturbance survey of the proposed development footprint

resulted in no new heritage resources being identified. No direct impacts to heritage resources are therefore anticipated.

Based on Digby Wells' understanding of the Project (refer to Section 1.2) while considering the defined cultural landscape and known heritage resources (refer to Section 5), Digby Wells recommends a Chance Finds Procedure (CFP) and a Fossils CFP be developed and included in the EMP to mitigate any identified low risks or unplanned events, should these occur.

Where these recommendations are implemented, Digby Wells does not object to the implementation of the Project.

DECLARATION OF THE SPECIALIST

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

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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 HCI Coal (Pty) Ltd or Mbali Coal (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Environmental Authorisation Application for the proposed Tweefontein Water Reclamation Plant and Mbali Colliery Pipeline located in Mpumalanga Province. I am fully aware of and meet all the requirements for specialist assessment, and that failure to comply may result in disqualification of this assessment. I have disclosed to the applicant all material information that has or may have the potential to influence the decision of the Department or the objectivity of this report as part of the application.

In signing this declaration, I am aware that a false declaration is an offence in terms of Regulation 48 of the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

Full Name:	Justin du Piesanie
Title/ Position:	Manager: HRM
Qualification(s):	MSc
Experience (Years):	11 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)

DECLARATION OF THE SPECIALIST

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

Contact person: Shannon Hardwick

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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 HCI Coal (Pty) Ltd or Mbali Coal (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Environmental Authorisation Application for the proposed Tweefontein Water Reclamation Plant and Mbali Colliery Pipeline located in Mpumalanga Province. I am fully aware of and meet all the requirements for specialist assessment, and that failure to comply may result in disqualification of this assessment. I have disclosed to the applicant all material information that has or may have the potential to influence the decision of the Department or the objectivity of this report as part of the application.

In signing this declaration, I am aware that a false declaration is an offence in terms of Regulation 48 of the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

Full Name:	Shannon Hardwick
Title/ Position:	Assistant HRM Consultant
Qualification(s):	MSc
Experience (Years):	1 year
Registration(s):	Association of Southern African Professional Archaeologists (ASAPA)

Compliance with Appendix 6 of the EIA Regulations 2014, as amended

Regulatory Requirements	Section of Report
(a) The person who prepared the report; and the expertise of that person to carry out the specialist study or specialised process.	Section 1.6
(b) a declaration that the person is independent	Page iv and v
(c) an indication of the scope of, and the purpose for which, the report was prepared	Section 1.5
(cA) an indication of the quality and age of base data used for the specialist report	Section 4.5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 6
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Sections 4.4 and 5.3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 and Appendix B
(f) 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	Sections 5.4 and 6
(g) an identification of any areas to be avoided, including buffers	Section 7
(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	Appendix C
(i) a description of any assumptions made and any uncertainties or gaps in knowledge	Section 3
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Section 6
(k) any mitigation measures for inclusion in the EMP	Section 7

Regulatory Requirements	Section of Report
(l) any conditions for inclusion in the environmental authorisation	Sections 7 and 8
(m) any monitoring requirements for inclusion in the EMP or environmental authorisation	Section 8
(n) 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 EMP, and where applicable, the closure plan	Section 10
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Section 11
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto	Section 11
(q) any other information requested by the competent authority	N/A

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 Introduction

Digby Wells Environmental (hereinafter Digby Wells) are providing specialist services to Mbali Coal (Pty) Ltd (hereinafter Mbali Coal), a wholly-owned subsidiary of HCI Coal (Pty) Ltd (hereinafter HCI Coal), to comply with the national legislative process for the Application for Environmental Authorisation (EA) of a new water pipeline between the Mbali Colliery and the Tweefontein Water Reclamation Plant (TWRP) at the Goedgevonden (GGV) Mine (*operated by Glencore Operations South Africa (Pty) Ltd*) (hereinafter *the Project*). The EA Application Process is being undertaken in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), and the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended).

This report constitutes the specialist Heritage Basic Assessment Report (HBAR) required in terms of GN R 983 Appendix 1 Subsections 2(d), 3(1)(h)(iv) and (vii) and Section 38(8) of the National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA). The HBAR was completed to comply with the requirements Section 38(3) and (8) of the NHRA and serves to inform the South African National Heritage Resources Agency (SAHRA) and the Mpumalanga Provincial Heritage Resources Authority (MPHRA) of the proposed Project.

1.1 Project background

The Department of Mineral Resources (DMR) granted the Mbali Colliery Mining Right in June 2008 (Reference No. MP 30/5/1/2/2 228 MR), with operations starting in October 2013. The extraction rate at the time of commencement was 150 000 tonnes per month, sourced from the number 4 and 5 coal seams using standard opencast mining methods. The extracted Run of Mine (RoM) coal is hauled to the washing plant located on the Mbali Colliery before sale for metallurgical purposes or for power generation by Eskom.

The washing plant utilises water pumped through the open pits and Pollution Control Dam (PCD), however, due to the current regional drought and consequent water shortage, alternative sources of water are required to continue operations at the plant.

Mbali Coal has identified the TWRP as an alternative water source to accommodate the current shortfall. As such, a new water pipeline between the Mbali Colliery and the TWRP is required to transport the treated water to the Mbali Colliery coal washing plant.

1.2 Project description

To transport the water from the TWRP to the Mbali Colliery, Mbali Coal must construct and licence a new water pipeline. The design capacity of the pipeline will be 2 Mℓ/day (2,000 m^3 per day at around 30 ℓ/s), with a diameter ~250 mm. The total approximate length of the pipeline will be 3.6 km routed along the existing R545 Road and Mbali Colliery access road and will include a 5 m servitude. The detailed engineering designs are not yet finalised but the pipeline will most likely include both above-ground and underground sections. The present proposal suggests that the above-ground components will include the connection with the TWRP and the crossing with the Klippoortjiespruit, where the pipeline will attach to

the existing bridge. The rest of the pipeline will be underground; it has been proposed that the pipeline be constructed beneath existing roads where necessary, but this is dependent on approval from the South African National Roads Agency Limited (SANRAL), the body responsible for maintenance of the roads.

Applicable listed and specified activities include the following:

Table 1-1: Listed and specified activities for the proposed project

Name of Activity	Areal extent of the activity	Listed Activity	NHRA Triggers
Construction and operation of the pipeline for the transfer of water from the TWRP to the Mbali Colliery coal washing plant. The proposed pipeline will be inside the road reserve, has a diameter of only 0.25 m and a throughput of only 30 ℓ/s. No listed activity is therefore triggered	Length – 3600 m Diameter – 0.25 m Servitude - 5 m, Area – 1.8 ha.	N/A	38(1)(a)
Construction and operation of the pipeline: construction of the pipeline over the Klippoortjiespruit may require the moving of more than 10 m^3 of material within the watercourse.	Length – 3600 m Diameter – 0.25 m Area – 0.09 ha.	GN R 983 – Activity 19	38(1)(c)(i)
Clearance of vegetation for the Construction and maintenance of the pipeline: the site is located in a threatened ecosystem [Eastern Highveld Grassland (Vulnerable)] and the Moist Grasslands Priority Area.	Length – 3600 m Diameter – 0.25 m Area – 0.09 ha.	GN R 985 – Activity 12	38(1)(c)(i)

1.3 Project location

The Mbali Colliery is located approximately 10 km south of Ogies in the Mpumalanga Province. The colliery covers portions 16, 17, 20, 31 and the Remaining Extent (RE) of portion 9 of the farm Klippoortjie 32 IS. The Goedgevonden (GGV) Mine and TWRP are situated approximately 3 km north of Mbali Colliery, on portion 35 of the farm Zaaiwater 11 IS.

Table 1-2 presents a summary of the Project location details.

Table 1-2: Project location summary

Towns	Ogies (roughly 10km to the northeast)		
Location	Adjacent to the R545 between Ogies and Bethal / Kriel		
Erf or farm number/s	The pipeline will be located in the existing road reserve along the R545, which traverses the following Farm Portions: ■ Klippoortje 32 Portion 4; ■ Klippoortje 32 Portion 17; ■ Klippoortje 32 Portion 30; and ■ Zaaiwater 11 Portion 35.		
Coordinates of approximate centre of project area	26°06'44.19" S		
	29°06'55.62" E		
District Municipality	Nkangala District Municipality		
Local Municipality	Emalahleni Local Municipality		
Extent of affected properties	Klippoortje 32	Portion 4	2 537.613 hectares (ha)
		Portion 17	122.490 ha
		Portion 32	57.157 ha
	Zaaiwater 11	Portion 35	34.923 ha
Current use of affected area	The pipeline will be constructed within a road reserve. The properties on which the road reserve currently exists is used for urban industrial (mining) and agriculture.		
Predominant land use/s of surrounding properties	Urban industrial (and urban built-up environment), agriculture		

1.4 Terms of Reference

The Terms of Reference (ToR) for the specialist heritage study was to conduct a Heritage Resources Management (HRM) Process in support of the EA application for the construction and operation of the Pipeline Project. Digby Wells completed the HRM Process in accordance with GN R 983 Appendix 1 Subsections 2(d), 3(1)(h)(iv) and (vii) and Section 38(8) of the NHRA.

1.5 Scope of Work

The Scope of Work (SoW) for the specialist HRM process was to complete the necessary Heritage Basic Assessment (HBA) process and Environmental Management Plan (EMP) in support of the EA application for the construction of the proposed pipeline in accordance with the requirements set out by the NEMA and NEMA EIA Regulations (2014, as amended). The following activities were completed as part of the SoW:

- Description of the predominant cultural landscape supported through secondary and primary data collection;
- Undertaking historical layering to identify potential structures older than 60 years that are protected under Section 34 of the NHRA, or any other tangible heritage resources;
- Assessment of the Cultural Significance (CS) of identified heritage resources;
- Identification of potential impacts to heritage resources based on Project-related activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that may be derived from the Project;
- Recommending feasible management or mitigation measures to avoid and/or minimise negative impacts and enhance potential benefits; and
- Submission of the HBAR to the SAHRA and MPHRA for Statutory Comment as required under Section 38(8) of the NHRA.

1.6 Expertise of the specialist

Table 1-3 presents the expertise of the HRM specialists who prepared this report. The relevant CVs are included in Appendix A.

Table 1-3: Expertise of the specialist

Team Member	Bio Sketch
Justin du Piesanie ASAPA Member 270 AMAFA Registered ICOMOS Member 14274 IAIAsa Member Years' Experience: 11	Justin is the HRM Manager at Digby Wells. Justin joined the company in August 2011 as an archaeologist and was subsequently made manager in the Social and Heritage Services Department. 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 United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention. He has over 11 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, Cameroon, the Democratic Republic of Congo, Liberia, Mali, Tanzania, and Senegal on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, Justin has acted as a

Team Member	Bio Sketch
	technical expert reviewer of HRM projects undertaken in Cameroon 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.
Shannon Hardwick ASAPA Member: 451 Years' Experience: 1	Shannon joined the Digby Wells team in May 2017 as a Heritage Management Intern, and has subsequently been appointed as an Assistant Heritage Resources Management Consultant. Shannon is an archaeologist who obtained an 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 *Journal of Ethnobiology*. Since joining Digby Wells, Shannon has gained generalist experience through the compilation of NID applications, cultural baselines and Heritage Impact Assessment (HIA) reports. Her other experience includes compiling a Community Health, Safety and Security Management Plan (CHSSMP) and researching Artisanal and Small-Scale Mining for input into a Livelihood Restoration Framework (LRF). Shannon's experience in the field includes pre-disturbance surveys in South Africa and fieldwork in Malawi.

1.7 Structure of the report

The remainder of the report, with references to the relevant information required in terms of Section 38(3) of the NHRA, is structured as per the below table. The requirements in terms of the compliance with Appendix 6 of the EIA Regulations, as amended, are presented in the preamble to the report and cross-referenced with the relevant sections.

Table 1-4: Structure of the report

Section	Description	NHRA information requirements
2	Outlines the legislative framework relevant to the specialist heritage study.	-
3	Identifies the specific constraints and limitations of the assessment.	-
4	Describes the methodology employed in the compilation of this report.	-
5	Provides the baseline cultural landscape.	38(3)(a)
6	Motivates for the defined CS of the identified heritage resources and landscape.	38(3)(b)
	Considers the potential impacts to heritage resources by project related activities.	38(3)(c)

Section	Description	NHRA information requirements
	Outlines possible risks to heritage resources and heritage related risks to the project.	
11	Presented the results of consultation.	38(3)(e)
10	Details the specific recommendations based on the contents of the assessment.	38(3)(g)
12	Collates the most salient points of the assessment and concludes with the specific outcomes and recommendations of the study.	38(3)(f) 38(3)(g)
13	Lists the source material used in the development of the report.	-

2 Legislative and policy framework

The HRM process is governed by the national legislative framework. Table 2-1 presents a brief summary of the relevant legislation pertaining to the conservation and responsible management of heritage resources.

Table 2-2 presents a summary of the policies considered in the HRM Process.

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

Applicable legislation used to compile the report	Reference where applied
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) 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 – 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	The HRM process is being undertaken to identify heritage resources and determine potential heritage impacts associated with the Project. As part of the HRM process, applicable mitigation measures, monitoring plans and/or remediation will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
NEMA The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of	The BA process is being undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2017 Regulations,

Applicable legislation used to compile the report	Reference where applied
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: *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.*	promulgated in terms of NEMA.
GN R. 982: Environmental Impact Assessment Regulations, 2014 (as amended by GN R 326 of 7 April 2017) The EIA Regulations 2014 (as amended) and associated 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: ▪ Regulation GN R. 983 (as amended) - 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) – 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) – 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	Listed activities detailed within the amended Listing Notices 1 and 3, will be triggered. To comply with the regulations, an EIA process must be completed in support of Environmental Authorisation. This HBAR specifically, was compiled to comply with the requirements of Appendix 1: Basic Assessment Process Section 2(d) and 3(1)(h)(iv) and (vii) of GN R 983 (as amended) and to inform the EIA process to comply with Section 24 of the NEMA.

Applicable legislation used to compile the report	Reference where applied
to be followed.	
NHRA 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: ▪ 5. General principles for HRM ▪ 6. Principles for management of heritage resources ▪ 7. Heritage assessment criteria and grading ▪ 38. Heritage resources management The Act requires that Heritage Resources Authorities (HRAs), in this case SAHRA and MPRHA, 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.	This HBAR will be submitted to the SAHRA and MPHRA and was compiled to comply with Section 5, 38(3), (4) and (8) of the NHRA.

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

Applicable policies used to compile the report	Reference where applied
SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The guidelines provide the minimum standards that must be adhered to for the compilation of a HBAR. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: ▪ 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.	The HBAR was compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007)

3 Constraints and limitations

The following limitations and constraints were experienced in the compilation of this report:

- Whilst every attempt to obtain the latest available information was made, the reviewed literature does not represent an exhaustive list of information sources for the various study areas (as defined in Section 4.1);
- Palaeontological and archaeological resources commonly occur at subsurface levels and so these resources may not be adequately recorded or documented by assessors without the use of destructive and intrusive methodologies. The reviewed literature and results of the field survey are therefore limited to surface observations;
- No informal consultation was undertaken by the Digby Wells heritage specialist with farm owners or managers during fieldwork; and

- This report was compiled prior to the regulated public review period. This report therefore does not consider the results of consultation as required by Section 38(3)(e) of the NHRA.

4 Methodology

The HBAR includes a brief Project background and cultural heritage baseline to contextualise the defined CS and assigned Field Ratings, as well as the potential risk and impacts identified in reference to heritage resources. This information further enables the relevant heritage authorities to specify any restrictions or additional requirements for inclusion in the EMP in support of the EA application. The activities used to develop the cultural heritage baseline profile, CS, Field Ratings and impact assessment are discussed separately below.

4.1 Defining the study area

Heritage resources do not exist in isolation to the greater natural and social environment, including socio-cultural, social-economic and socio-political contexts. The NHRA requires the grading of heritage resources in terms of national, provincial and local concern, based on their importance and therefore on the official (i.e. State) management effort required. These categories require different types and levels of baseline information to adequately predict potential heritage impacts. Three 'concentric' study areas were defined for the purpose of this study, which include:

- The *site-specific* study area: the farm portions associated with the proposed project, including a 500m buffer area or, in a linear development, the proposed development footprint(s) including a 200m buffer on either side. The site-specific study area here extends linearly (i.e. the proposed pipeline) and so is defined by the latter criteria. The site-specific study area is situated within the Emalahleni Local Municipality within the Nkangala District Municipality;
- The *local* study area: the area most likely to be influenced by any changes to heritage resources in the project area, or where project development could cause heritage impacts. The local study area is defined as the area within a 10km radius of the Project (in this case, this included sites in the Emalahleni and Victor Khanye Local Municipalities within the Nkangala District Municipality and the Govan Mbeki Local Municipality within the Gert Sibande District Municipality with particular reference to the immediate surrounding properties or farms. The local study area was specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provided the local development and planning context that may contribute to cumulative impacts; and
- The *regional* study area: the area bounded within a radius of 10km to 50km from the development footprint. Where necessary, the regional study was extended outside the boundaries of the district municipality to include much wider regional expressions

of specific types of heritage resources and historical events. This study included areas of the Nkangala and Gert Sibande District Municipalities as above. The regional study area also provided the regional development and planning context that may contribute to cumulative impacts.

4.2 Developing cultural significance and field ratings

Digby Wells has designed a significance rating process to provide a numerical rating of the CS[1] of identified heritage resources. This process considers heritage resources assessment criteria as set out in subsection 3(3) of the NHRA to determine the intrinsic, comparative and contextual significance of identified heritage resources. The importance rating of a resource is based on information obtained through a review of available credible sources as well as its representativity or uniqueness (i.e. known examples of similar resources to exist).

The matrix rated the importance (or the potential) of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social. Resource significance was directly related to the impact on it that could result from project-related activities, as it provided minimum accepted levels of change to the resource.

The value of an identified heritage resource is determined prior to the completion of any assessments of impacts. A heritage resource's value is a direct indication of its sensitivity to change (i.e. impacts).

4.2.1 Determining the CS

CS was determined based on identified resources' importance or contribution to four broad value categories: aesthetic, historical, scientific and social values. These categories summarised the CS and other values described in Section 3(3) of the NHRA. The resources' importance or contributions to these values were considered in terms of associative (qualitative) and / or rarity (quantitative) attributes, based on collected secondary data. The integrity or condition of resources further influenced the CS. Integrity is largely determined based on resources' current, observed state of conservation, as well as notable changes made to it over the years.

4.2.2 Determining Field Ratings

Field ratings assist the responsible heritage resources authority to grade heritage resources into national (Grade I), provincial (Grade II) or local (Grade III) categories, and are required under Chapter II Section 7(J) of the SAHRA Minimum Standards.

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

Field ratings considered the assigned CS and the level of official management required or the local competency of heritage authorities[2].

4.3 Impact Assessment Methodology

Appendix B includes the detailed methodology for the impact assessment process used specifically for this specialist report. The definition of heritage impacts is explained in detail below.

4.3.1 Defining heritage impacts

Potential impacts to heritage resources may manifest differently across geographical areas or diverse communities when one considers the simultaneous affect 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).

Table 4-1: Definition of impacts

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: ■ 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

[2] Currently MPHRA is only competent to manage and issue permits on NHRA Section 34 heritage resources, and no local (i.e. local government) competency exists within the province. All decisions relating to archaeology, palaeontology and burial grounds and graves therefore fall under the ambit of SAHRA.

	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 Primary data collection

Primary data was collected by a Digby Wells specialist, Justin du Piesanie, through a pre-disturbance survey of the site-specific study area. The survey was carried out on 05 December 2017 through pedestrian and vehicular methodologies.

The survey was non-intrusive (i.e. no sampling was undertaken) with the objectives to:

- Visually record the current state of the cultural landscape;
- Ground-truth certain heritage resources and sites identified through the literature; and
- Record a representative sample of visible tangible heritage resources present within the site-specific and local study areas.

Identified heritage resources are recorded as waypoints using handheld GPS and documented through written and photographic records. The results of the survey are discussed in Section 5.3.

4.5 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 HBAR and was obtained through secondary information sources including a 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. Credible, relevant sources were then critically reviewed. The objectives of the literature review were to:

- Gain an understanding of the cultural landscape within which the proposed Project is located; and
- Identify any potential fatal flaws, sensitive areas, current social complexities / issues and known or possible tangible heritage.

Repositories that were surveyed included the South African Heritage Resources Information System (SAHRIS) database as well as online or electronic journals and platforms, and certain internet sources. This HBAR only includes a summary and discussion of the most relevant findings. Relevant sources were cited and included in the literature review's reference list.

Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information System (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 / absence of visible features; and
- Identifies potential locations where heritage resources may exist within an area.

All sources that were consulted for this HBAR are listed in Table 4-2 below.

Table 4-2: Qualitative data sources

Reviewed Qualitative Data		
Databases		
SAHRIS	Statistics South Africa, 2011	
SAHRIS Cases		
Case ID 102	Case ID 7332	Map ID 672
Case ID 4249	Case ID 8026	Map ID 654
Case ID 5914	Case ID 8831	Map ID 648
Case ID 6492	Case ID 166	Map ID 710
Case ID 3020	Case ID 174	Map ID 711
Case ID 6397	Case ID 2261	Map ID 1153
Case ID 4919	Case ID 6391	Map ID 1164
Case ID 10237	Case ID 8410	Map ID 1165
Case ID 7332	Case ID 5472	Map ID 1668
Case ID 9087	Case ID 2043	Map ID 1718

Reviewed Qualitative Data		
Case ID 9959	Case ID 11829	Map ID 2179
Case ID 9216	Map ID 707	Map ID 2418
Case ID 10490	Map ID 1123	Map ID 2907
Case ID 4801	Map ID 719	
Cited Text		
Bamford 2012, 2014, 2016	Behrens & Swanepoel, 2008	Brodie, 2008
Clark, 1982	Deacon & Deacon, 1999	Delius & Cope, 2007
Delius, et al., 2014	Eastwood, et al., 2002	Groenewald & Groenewald, 2014
Holden & Mathabatha, 2007	Huffman, 2004, 2007	Johnson, et al., 1996, 2006
Landau, 2010	Maggs 1974, 1976	Makhura, 2007
Mucina & Rutherford, 2010	National Biodiversity Institute, 2004	Pakenham, 1979
Potgieter, 1955	Rubidge, 2008, 2013a, 2013b	SAHRA 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2017
Smith & Zubieta, 2007	Smith & Ouzman, 2004	Swanepoel, et al., 2008
Voortrekkers, 2014	Wessels, 2010	Willsworth, 2006
Winter & Baumann, 2005	von der Heyde, 2013	

A more detailed list of works cited is included in Section 13.

4.6 Site naming convention

Heritage resources identified by Digby Wells during the field survey were prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period / feature code and site number followed (e.g. 12104/BGG-001). This number may be shortened on plans or figures to the period / feature code and site number (e.g. BGG-001).

Heritage resources identified through secondary data collection were prefixed by the relevant SAHRIS case or map identification (*where applicable*), and the original site name used by the author (e.g. 138/Site1).

5 Existing Environment

5.1 Current natural environment

The current natural environment of the site-specific study area comprises vegetation of the Eastern Highveld Grassland (Unit Gm 12, Mesic Highveld Grassland Bio-region of the Grassland Biome). Short, dense grassland dominated by Highveld grasses, including various species within the *Aristida, Digitatia, Eragostis, Themeda* and *Tristachya* genera characterise this unit. Woody species associated with this unit comprise *Acacia caffra, Celtis africana, Diospyros lycoides* subspecies *lycoides, Parinari cepenses* and *Sersia magalismontanum* as well as several species of *Protea* (Mucina & Rutherford, 2010).

The National Biodiversity Institute (NBI), further designated the site-specific study area as a Moist/Wet Grassland Biodiversity area during a national assessment in 2004 (National Biodiversity Institute, 2004). This designation considered against the threats from socio-economic development in the region makes it one of the highest ranking in respect of biodiversity conservation. The most significant risk to this area is impacts to land capability, specifically crop potential.

5.2 Cultural Heritage Baseline

This section presents an abbreviated description of the cultural landscape. Table 5-1 presents the broad timeframes for the major periods of the past in Mpumalanga.

Table 5-1: Archaeological Periods in Mpumalanga (adapted from Esterhuysen & Smith, 2007)

Age	Period	Timeframe
The Stone Age	Early Stone Age (ESA)	2 million years ago (mya) to 250 thousand years ago (kya)
	Middle Stone Age (MSA)	250 kya to 20 kya
	Later Stone Age (LSA)	20 kya to 500 Common Era (CE)[3]
There appears to be a gap in the record in Mpumalanga between approximately 7 000 and 2 000 Before Common Era (BCE).		
Farming Communities	Early Farming communities (EFC)	500 to 1400 CE

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

Age	Period	Timeframe
	Late Farming Communities (LFC)	1100 to 1800 CE
Historical Period	1500 CE to 1994 (Behrens & Swanepoel, 2008)	

The tangible heritage resources demonstrate affiliations with the historical period, dominated by the historical built environment, burial grounds and graves. This notwithstanding, expressions of palaeontological, MSA, LSA and LFC have been recorded in the regional study area.

In total, 651 heritage resources were identified within the regional study area. Table 5-2 and Figure 5-1 present the identified heritage resources types. No heritage resources were identified during the pre-disturbance survey of the proposed pipeline footprint.

Table 5-2: Previously identified heritage resources within the regional study area

Heritage Resource Type	Number of records
Palaeontological	1
Archaeological – MSA	3
Archaeological – LSA	1
Archaeological - LFC	37
Battlefield	1
Burial Grounds and Graves	404
Historical Built Environment	201
Monuments and Memorials	1
Intangible / Living	2
Grand Total	**651**

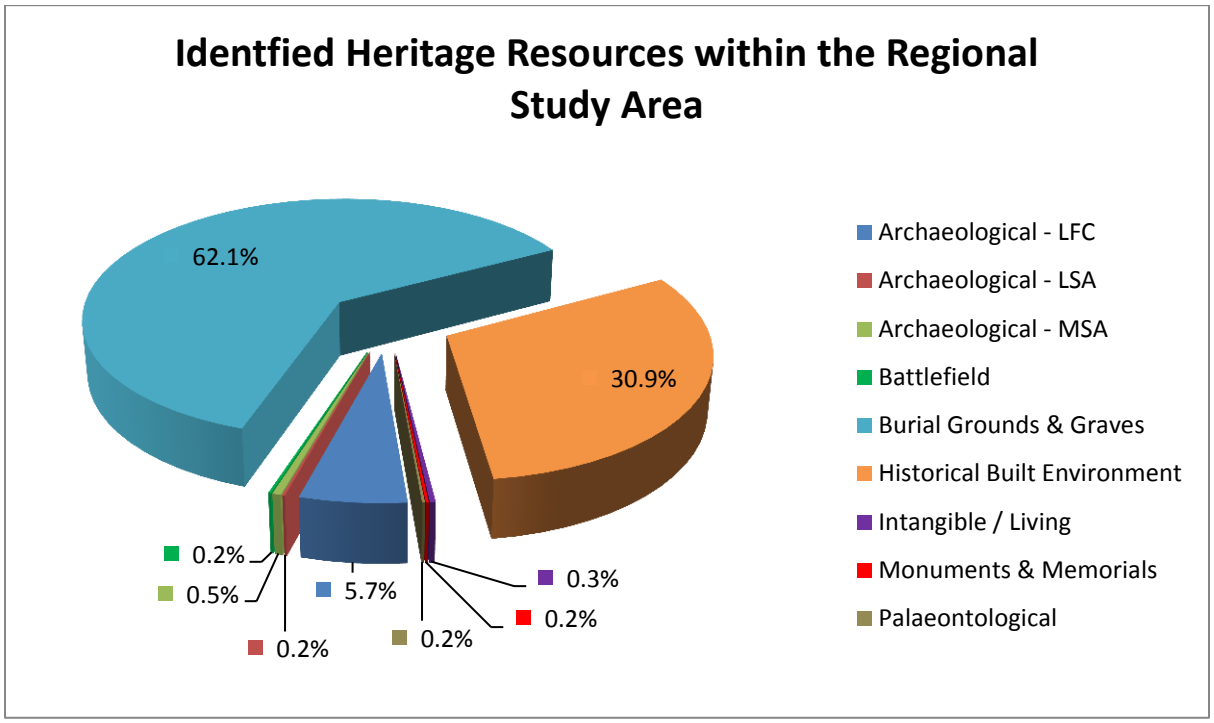

Figure 5-1: Heritage resources identified within the regional study area

5.2.1 Geology and palaeontological sensitivities

Mpumalanga is underlain by valuable geological formations, both in terms of mineral and fossil wealth (Johnson *et al* 2006; Groenewald & Groenewald, 2014). Briefly, these comprise:

- The Karoo Supergroup;
- The Waterberg Group;
- The Bushveld Complex; and
- Transvaal Supergroup.

These lithic units are represented in the regional study area by:

- The Dwyka Group, *Vryheid Formation* and the Karoo dolerites;
- The *Wilge River Formation*;
- The Rashoop Granophyre Suite and the Lebowa Granite Suite;
- And the *Rooiberg Formation* respectively.

The relevant geological sequence is illustrated in Table 5-3.

The regional and local study areas form part of the Highveld Coalfield, which extends approximately 7 000 km^2, and are predominantly underlain by the Main Karoo Basin

(Johnson, et al., 2006). This basin comprises lithostratigraphic units associated with the Karoo Supergroup and dates to the Late Carboniferous to Middle Jurassic Periods (roughly 320 to 145 mya). The Main Karoo Basin constitutes a retro-arc foreland basin. As described by Johnson *et al* (2006), this is because of:

- The thick flysch-molasse succession which wedges out northwards over the adjacent craton;
- It Main Karoo Basin's position behind an inferred magmatic arc; and
- The associated fold thrust belt produced by northward subduction of oceanic lithosphere located south of the arc.

These processes allowed for sedimentation of the basin, forming what is collectively known as the Karoo Supergroup (Johnson, et al., 2006). These sediments cover approximately 700 000 km^2, including the site-specific study area. The Karoo Supergroup is well known for the terrestrial vertebrate fossils, distinctive plant assemblages, thick glacial deposits and extensive dolerite dykes and sills among the sediments (Johnson, et al., 1996; 2006). Figure 5-2 illustrates the extent of the Karoo basins as well as the envisaged plate tectonic setting of the basin in the Late Triassic.

Within the Karoo Supergroup are the sediments of the Ecca Group (dating to the Permian Period), the most paleontologically sensitive of the geological layers, which overlie the *Dwyka Formation* (labelled 'D' in Figure 5-2). These Ecca Group sediments are well-known for the wealth of plant fossils, characterised by assemblage of *Glossopteris* (plant species which are defined through fossil leaves) and contain significant coal reserves (Groenewald & Groenewald, 2014).

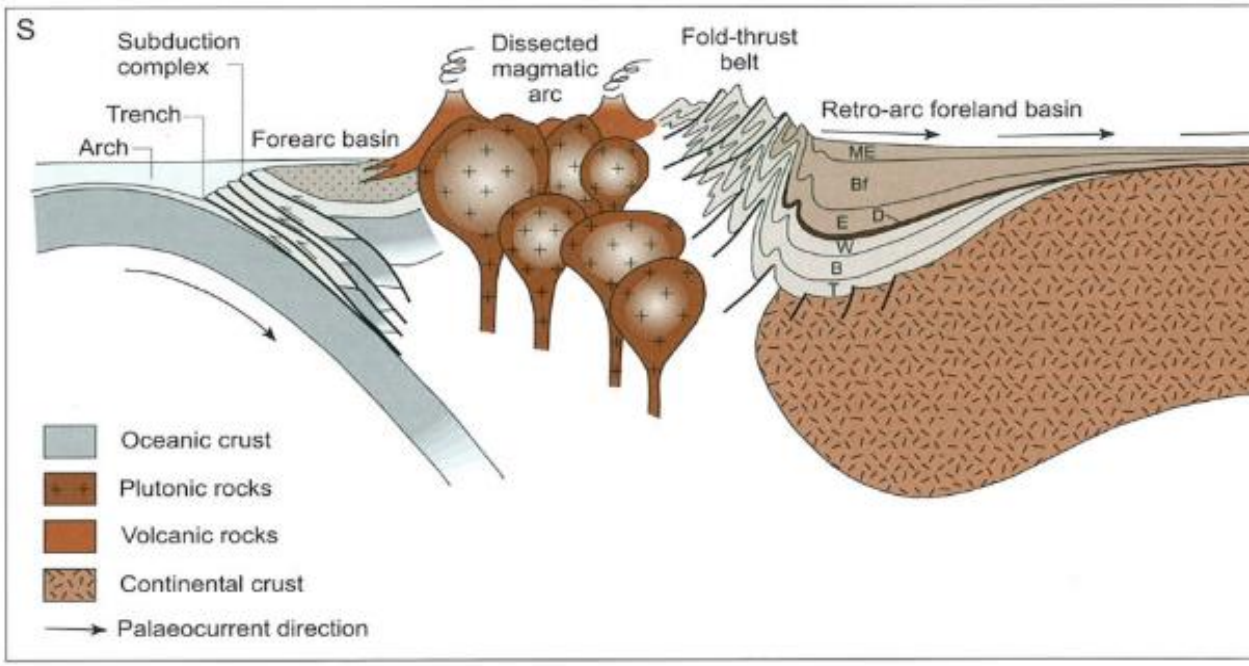

Figure 5-2: Location and envisaged plate tectonic setting of the Main Karoo Basin during the Late Triassic. D = Dwyka Group, E = Ecca Group (adapted from Johnson *et al.* 2006)

Locally, the study area is underlain by the Karoo and Transvaal Supergroups. The Karoo Supergroup is represented by the *Vryheid Formation* and the Karoo Dolerite Suite (Rubidge, 2008; Rubidge, 2013a; Rubidge, 2013b). The Karoo dolerites are intrusive diatremes[4] classified as plutonic igneous rocks. These features include no fossiliferous material and their palaeo-sensitivity is negligible (Rubidge, 2013a; 2013b; SAHRA, 2013a; 2017). The Karoo dolerite suite is therefore considered no further in this report.

The local study area is primarily underlain by lithologies associated with the Ecca Group. Formations within the Ecca Group include:

- The *Pietermaritzburg Formation*, which rarely forms good outcrops and fossils are rare and difficult to find. This formation is of moderate palaeontological sensitivity;
- The *Vryheid Formation*, which is the main coal-producing formation in South Africa. This formation has produced a number of fossils, including extensive *Glossopteris* assemblages. Other fossils reported from this formation include: trace fossils, rare insects, possible conchostracans (bivalve crustaceans and shrimp clams, which are presently still extant), non-marine bivalves and fish scales; and
- The *Volksrust Formation*: monotonous sequence of grey shale. Fossils are significant but rare and include: temnospondyl amphibian remains, invertebrates and minor coal with plant remains, petrified wood and trace fossils assemblages (Groenewald & Groenewald, 2014).

The *Vryheid Formation* has a very-high palaeo-sensitivity (SAHRA, 2013b; 2017) and is the primary potential fossil-bearing layer underlying the site-specific study area. The *Vryheid Formation* corresponds to the basal unit of the Ecca Group, which was deposited roughly 180 mya in a deltic[5] environment (Bamford, 2016).

Shales, sandstones, mudstones and coal feature all constitute this formation (Bamford, 2016). Coal is formed through the compression and heat alteration of plant matter. During the formation of coal, alteration happens to such an extent that potential plant fossil remains are no longer recognisable. The shales between the coal horizons, however, have the potential to preserve very good examples of plant fossils (Bamford, 2014; 2016). To a lesser extent, the sandstone surface outcrops may also preserve fossil plants. Common fossil plants that could be expected within the *Vryheid Formation* include *Glossopteris* leaves, roots and inflorescences; and *Calamites* stems. These potential plant fossils are illustrated in Figure 5-3. Coal deposits can potentially also include fossils of mammal-like reptiles and mammals. These are however, rarely, if ever, preserved with plant fossils (Bamford, 2012; 2016).

[4] These formations are created when rising magma comes into contact with groundwater, which potentially results in gaseous explosions and a volcanic 'pipe' (diatreme).

[5] This occurs when lithologies are deposited onto an alluvial plain through river action.

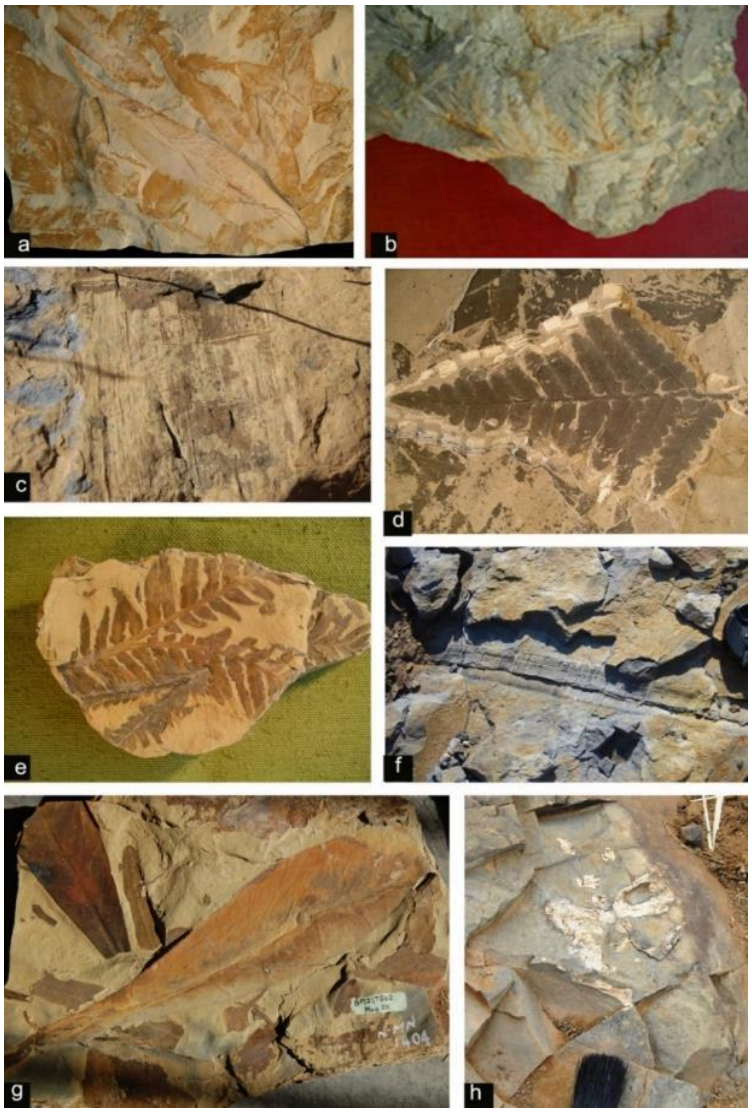

Figure 5-3: Composite of possible Karoo-aged fossil plants that may be identified within the site-specific study area (Bamford, 2016)

The Transvaal Supergroup is represented within the local study area as outcrops of the Rooiberg Group (as shown in Plan 3 in Appendix C). Fossils associated with the Transvaal Supergroup potentially include thick deposits of stromatolites (the ancient predecessors of modern algal mats) and stromatolitic dolomite (Groenewald & Groenewald, 2014). Despite its low palaeontological sensitivity and the presence of these fossils in other lithic units of the Transvaal Supergroup, no such fossils have as yet been recorded in the Rooiberg Group (Groenewald & Groenewald, 2014; SAHRA, 2013c). This is most likely because of the fluvial depositional setting of the group and the subsequent metamorphic processes which have taken place within the layers.

Table 5-3: Geological sequence and palaeontological sensitivity for the local study area

Eon	Era	Period	Epoch	MYA	Lithographic Units				Significance	Fossils
					Supergroups	Groups	Sub-groups	Formation		
Phanerozoic	Mesozoic	Jurassic		145 200				Karoo dolerites	Negligible	None
	Palaeozoic	Permian			Karoo Supergroup	Ecca Group		*Volksrust*	High	The Volksrust Formation comprises of trace fossils, rare temnospondyl amphibian remains, invertebrates (bivalves, insects), minor coals with plant remains, petrified wood, organic microfossils (acritarchs), and low-diversity marine to non-marine trace fossil assemblages.
								Vryheid	Very-high	Abundant plant fossils of Glossopteris and other plants. Trace fossils. The reptile Mesosaurus has been found in the southern part of the Karoo Basin. Rich fossil plant assemblages of the Permian Glossopteris Flora (lycopods, rare ferns and horsetails, abundant glossopterids, cordaitaleans, conifers, ginkgoaleans), rare fossil wood, diverse palynomorphs. Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves, fish scales.
				300		Dwyka Group			Low	Fossils predominantly from glacial, interglacial and post-glacial sediments and include: trace fossils, organic-walled microfossils, fish and vascular plants. Marine invertebrates (e.g. molluscs) are rare but do occur[6].

[6] (SAHRA, 2013d)

Eon	Era	Period	Epoch	MYA	Lithographic Units				Significance	Fossils
					Supergroups	Groups	Sub-groups	Formation		
Proterozoic	Mokolian			1700 2050		Waterberg Group		*Wilge River*	Low	Fossils within the Waterberg Group include some of the earliest known terrestrial cyanobacterial mats. These have been recorded from the playa lake deposits[7].
	Vaalian			2100	Bushveld Complex[8]			Rashoop Granophyre Suite	Negligible	None
								Lebowa Granite Suite	Negligible	None
Archaean				2500	Transvaal Supergroup	Rooiberg Group			Low	Fossils within the minor sedimentary units included in the group are unlikely because of the fluvial depositional setting, which has subsequently been metamorphosed. If found, fossils may potentially include stromatolites.

[7] (SAHRA, 2013e)

[8] (SAHRA, 2013f)

5.2.2 Stone Age

The Stone Age in southern Africa comprises three broad phases:

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

These phases are determined according to the lithic tools and material culture produced by the various hominid species through time. Within the regional study area, no expressions of ESA material were noted in the available resources. This period is therefore not considered further in the assessment.

The review of available data highlighted very few expressions of MSA (3 records accounting for 0.5% of the total identified heritage resources) and LSA (1 records or 0.2%) as shown in Figure 5-4. The MSA is represented in the regional study area as low-density surface scatters and one medium density surface scatter (Fourie, et al., 2000; Digby Wells, 2016)[9].

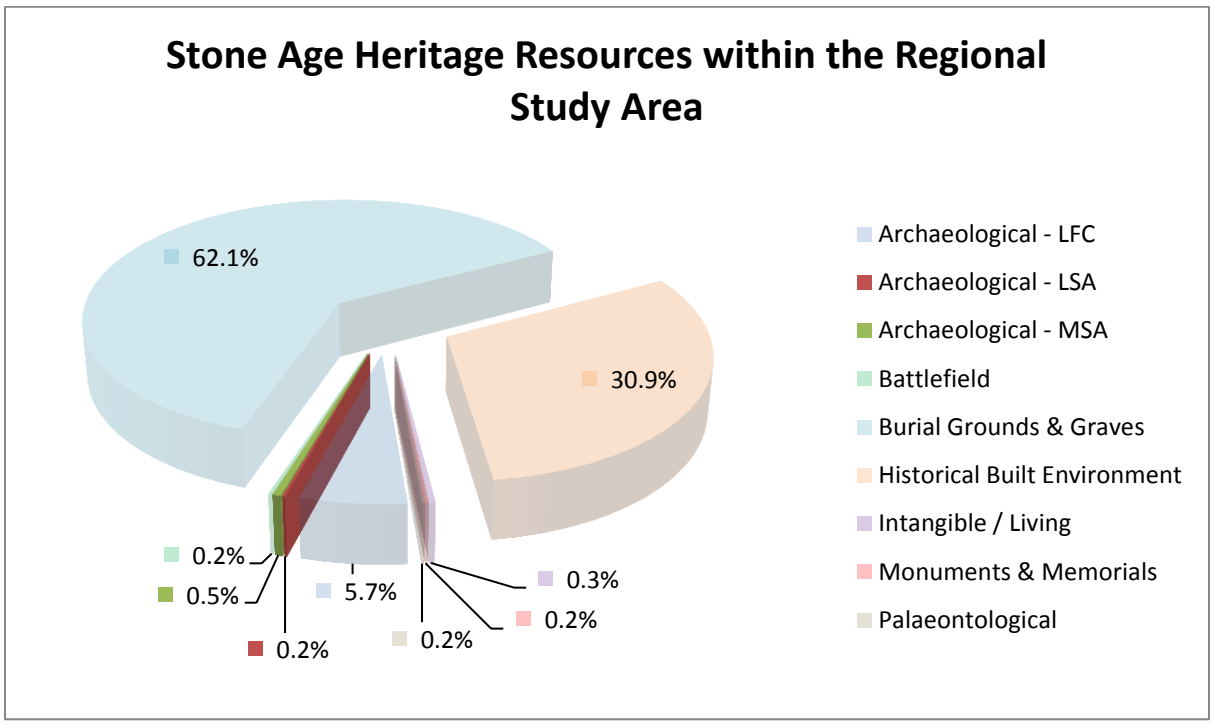

Figure 5-4: Stone Age resources identified within the regional study area

[9] These reports are referenced by their SAHRIS Case and Map ID numbers in Table 4-2 and are available from the SAHRIS website.

In South Africa, the MSA dates from approximately 300 kya to 20 kya. The lithic industries of the early MSA are characterised by high proportions of minimally modified blades, which created using the Levallois technique (Clark, 1982; Deacon & Deacon, 1999). The use of good quality raw material defines the period, as does the presence of bone tools, ochre, beads and pendants in the archaeological record.

The LSA dates between 40 kya to the historical period, closely associated with hunter-gatherer occupation. During this period, lithics are specialised – specific tools have been created for specific tasks (Mitchell, 2002; Makhura, 2007). Bone points and diagnostic tools such as scrapers and segments are commonly included in assemblages. These sites are often open and poorly preserved.

The LSA is further defined by evidence of ritual practices and complex societies (Deacon & Deacon, 1999). Within Mpumalanga, three rock art traditions have been identified and documented. These traditions are widely dispersed and are most notably recorded in the northern and eastern regions. No rock art sites, however, were recorded within the study areas under consideration.

5.2.3 Farming Community Period

The farming community period is defined by the movements of Bantu-speaking agro-pastoralists into southern Africa. This movement included ancestors of modern Sotho-Tswana and Nguni peoples (Makhura, 2007). As mentioned previously, this time period is divided into the EFC and LFC (refer to Table 5-1).

No heritage resources from the EFC period were identified within the study area. This period is therefore not considered further in the assessment. The LFC dates from 1100 to 1800 CE. Heritage resources from this period were identified and accounted for 37 of the identified heritage resources (or 5.7%) in the regional study area, as shown in Figure 5-5.

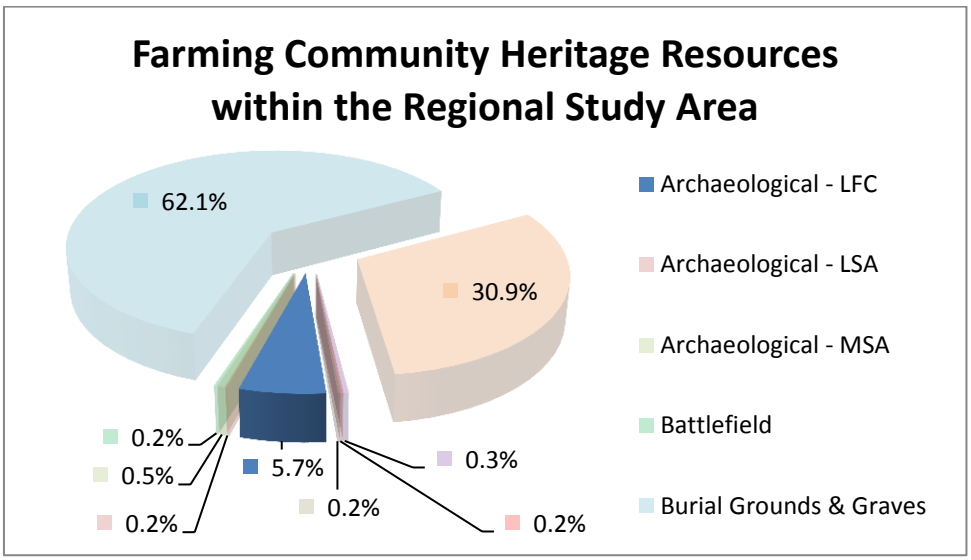

Figure 5-5: Farming Community resources identified within the regional study area

The most visible indicator of LFC settlements is stonewalling. These features attest to the complex processes of development and decline over several years (Delius, et al., 2014). Maggs (1974) and Delius *et al* (2014), among others, have argued that earlier regional occupation predominantly occurred at lower altitudes in the valleys, close to rivers. These sites were covered by soil accumulations after the sites were abandoned; this soil accumulation could also result in these sites remaining unidentified due to the lack of surface indicators.

Multiple stonewalled settlement types are found within the regional study area, including:

- Bokoni, also referred to as Badfontein (16th Century);
- KwaMaza (1700 – 1840 CE); and
- Type V (19th Century).

Bokoni, or Badfontein, settlements are linked to the movement of Nguni speakers (Huffman, 2007; Delius, et al., 2014). These settlements cluster along rivers and are distributed primarily along the escarpment between Carolina and Ohrigstad (approximately 100km east and 210km northeast of the site-specific study area respectively) (Huffman, 2004; Delius, et al., 2014). KwaManza settlements commonly occur near the Stoffberg region, which is outside the study area (Huffman, 2007). Bokoni and KwaManza walling occur outside of the study area and are therefore considered no further.

Within the local study area, Type V settlements are the most common and most widely distributed and these sites occur around Bethal and Ermelo in the south-east region of Mpumalanga. The settlements include of a number of primary enclosures that are grouped around a ring (Maggs, 1976). The enclosures can be either contiguous or linked by secondary walling to form a secondary enclosure. There may also be free-standing structures around the periphery of the settlement, but there is no surrounding wall.

Ceramic and evidence for domesticated animals (such as dung deposits or faunal remains) can also be used to identify LFC sites. These objects can provide motivation for settlements and possible trade networks (Delius, et al., 2014) and are distributed across the region. Huffman (2007) provides a reference for the possible distribution of ceramic facies within the regional study area; this is summarised in Table 5-4.

Table 5-4: Ceramic facies commonly found in Mpumalanga (Huffman 2007)

Facies	Key Characteristics	Period
Uitkomst	Stamped arcades, appliqué and blocks of parallel incisions, stamping and chord impressions	1650 CE – 1820 CE
Rooiberg	Stamped rim band, mixture of stamped and incised bands, arcades and triangles in the neck	1650 CE – 1750 CE

Facies	Key Characteristics	Period
Icon	Multiple incised bands separated by colour and lip decorations on bowls	1300 CE – 1500 CE
Madikwe	Multiple bands of cord impressions, incisions, stabs and punctates separated by colour	1500 CE – 1700 CE
Letaba	Hatched bands on shoulder, below black and red triangles	1600 CE – 1840 CE
Klingbeil	Triangles in neck bordered with slashes, punctates on shoulder	1000 CE – 1200 CE

Within the regional study area, identified LFC heritage resources include:

- A site of medium complexity (Van Schalkwyk, 2003b);
- Structural sites, including stone walling or structural remains (ruins of homesteads or circular stone structures) (Fourie, et al., 2000; Van Schalkwyk, 2003b; Van Schalkwyk & Moifatswane, 2003; Pelser & Van Vollenhoven, 2008; Karodia Khan & Nel, 2014; Digby Wells, 2018);
- Isolated ceramic potsherds and low density surface scatters (Karodia Khan & Nel, 2014; Pelser, 2015); and
- Ash deposits or middens, which are most likely the remains of cattle kraals or refuse dumps containing artefacts relating to this period (Van Schalkwyk, 2003b).

5.2.4 The Historical Period

The division between the LFC and historical period is artificial, as there is a large amount of overlap between the two periods. The historical period[10] is commonly defined as the period characterised by contact between Europeans and Bantu-speaking African groups and written records associated with this interaction characterise this time.

Migration, population growth, climatic variation and trade to the east define the transitions between the LFC and the historical period and later the historical period of the Mpumalanga Highveld. Power blocs emerged across the Highveld and resulted in violent displacement and political centralisation (Makhura, 2007). Here, the Pedi grew to become the strongest power in the north-east of the Highveld, amongst the escalating conflict and intensifying violence. Similar processes played out in the Nguni region and contributed to the rise of

[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, but is being explored through the 500 year initiative (Swanepoel, et al., 2008).

several large, aggressive states, including: the Ndwandwe, the Mthethwa, the Swazi and the Zulu Kingdom (Delius, et al., 2014).

An example of the overlap between the LFC and the historical period is the period of violence and upheaval between 1817 and 1826 AD, known as the Mfecane or the Difaqane (the latter term being more commonly used north of the Orange River) (Landau, 2010). Many aspects of the Mfecane/Difaqane have been debated and challenged, but traditional understanding of the period is that the Zulu group (led by Shaka) pushed Mzilikazi and his Ndebele group out of their territory. This displacement had a knock-on effect and subsequently displaced multiple groups to the north and the west. A drought exacerbated the instability and increased the pressure on food supplies, which were already running low.

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 (Landau, 2010). At this time, the *Voortrekkers* were intruding into an already volatile interior and exacerbated the strife in this area, frequently skirmishing with remnant Pedi, Nduzundza Ndebele and Kopa groups (Delius & Cope, 2007; Voortrekkers, 2014). The Voortrekkers were a group of Afrikaaners who initiated a move away from the Cape towards the interior in approximately 1835. This move is commonly referred to as the Great Trek (or *Groot Trek*). The first group to embark on the Great Trek was the Robert Schoon Party in 1836 and the first permanent settlement that was established as a result of this movement was Ohrigstad in 1845.

In 1852, *Voortrekker* and British representatives signed the Sand River Convention into effect. The convention acknowledged Trekboer independence and officially established the *Zuid-Afrikaansche Republiek* (ZAR). The independence of the ZAR allowed for land to be distributed to its citizens, though the demarcation of farms and the issuing of title deeds. Under their perceived right to land, the Trekboers continued their violent encounters with the smaller groups in this region; these conflicts resulted in a Trekboer-Swazi alliance (Delius & Cope, 2007; Voortrekkers, 2014).

The Trekboers (who had now become farmers) soon discovered and began exploiting the Highveld Coalfields. The coal was initially used as a domestic resource until the discovery of gold in the Witwatersrand in 1886 created an enormous demand for coal (Brodie, 2008; Pistorious, 2008a; 2008b). This increase in the demand for coal drove the commercial exploitation of the coal, until the industry was put on hold by the South African War.

Also known as the Second Anglo-Boer War or the Anglo-Boer War, the South African War officially started on October 9th, 1899 and lasted until 1902. The war was the result of building tensions and conflicting political agendas between the Trekboers and the British. There are two notable battles associated with the South Africa War within the regional and local study areas: the Battles of Lake Chrissie (February 6th, 1901) and Bakenlaagte (October 30th, 1901) respectively. No physical remains of these battlefields exist and so the

boundaries of these sites cannot be determined. Other important Boer War events in the broader area include:

- Trigaardsfontein (10 December 1901),
- Klippan (18 February 1902); and
- Boschmanskop (1 April 1904) (Van Vollenhoven, 2012a).

Historical heritage resources make up the large majority of the identified heritage resources in the regional study area, as shown in Figure 5-6.

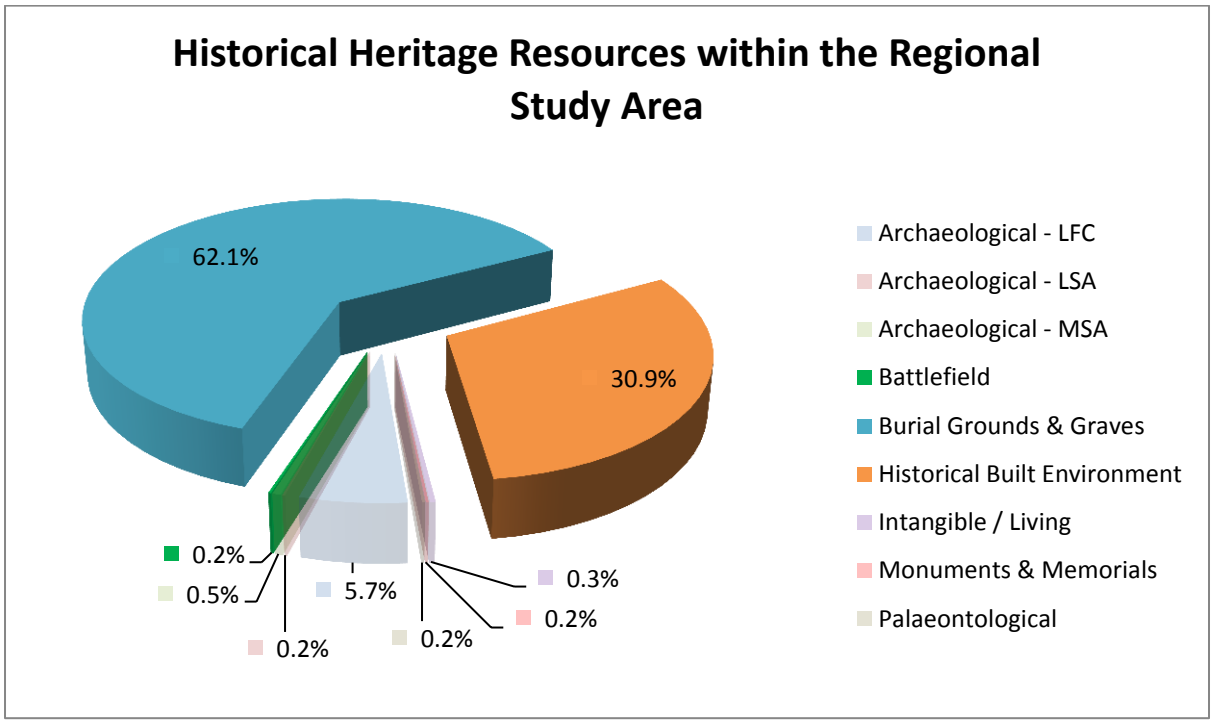

Figure 5-6: Historical resources identified within the regional study area

Historical heritage resources within the regional study area are represented as:

- The battlefield associated with the Battle of Bakenlaagte (Van Vollenhoven, 2012a; 2014a; Digby Wells, 2018);
- Burial grounds and graves, ranging from single burials to graveyards containing over one hundred individuals (Van Schalkwyk, 1997a, 1997b, 2002a, 2002b, 2002c, 2003b, 2009; Fourie, et al., 2000; Van Schalkwyk & Moifatswane, 2003; Pistorius, 2004, 2008, 2012, 2014, 2015, 2016; De Jong, 2007; Fourie, 2008, 2012; Pelser & Van Vollenhoven, 2008; Kusel, 2010; Birkholtz, 2011, 2013; Van Vollenhoven, 2012a; 2012b; 2014a; 2014b; 2015a, 2015b; 2017; Higget, 2013; Higgit & Karodia Khan, 2014; Digby Wells, 2014a; 2014b; 2016, 2018; Celliers, 2015; Van der Walt, 2015); and

- Historical built environment resources, such as structural remains (stonewall structures, homesteads, farmhouses and functional structures) and structural complexes; middens and ash deposits (Huffman & Calabrese, 1996; Van Schalkwyk, 1997a; 2002a; 2002c; 2003a; 2009; De Jong, 2007; Fourie, 2008; Pelser & Van Vollenhoven, 2008; Pistorius, 2008; 2012; Pistorius, 2016; Kusel, 2010; Birkholtz, 2013; Higget, 2013; Higgit & Karodia Khan, 2014; Karodia Khan & Nel, 2014; Van Vollenhoven, 2012a; 2014a; 2015a; 2017; Digby Wells, 2014b, 2016, 2018; Celliers, 2015).

5.3 Field survey results

Justin du Piesanie undertook a non-intrusive, pedestrian and vehicular pre-disturbance survey of the development footprint on 5 December 2017. No heritage resources or palaeontological surface features (i.e. outcrops of palaeontologically significant formations) were identified within the proposed pipeline routing development footprint. The survey was recorded with a handheld GPS unit and is illustrated as track logs in Plan 4 included in Appendix C.

Historical layering was undertaken to identify potential structures that may be older than 60 years and would therefore be protected under Section 34 of the NHRA. No such structures were identified on the historical map, which is presented below in Figure 5-7. The proposed pipeline footprint routing development footprint is shown in red on the image.

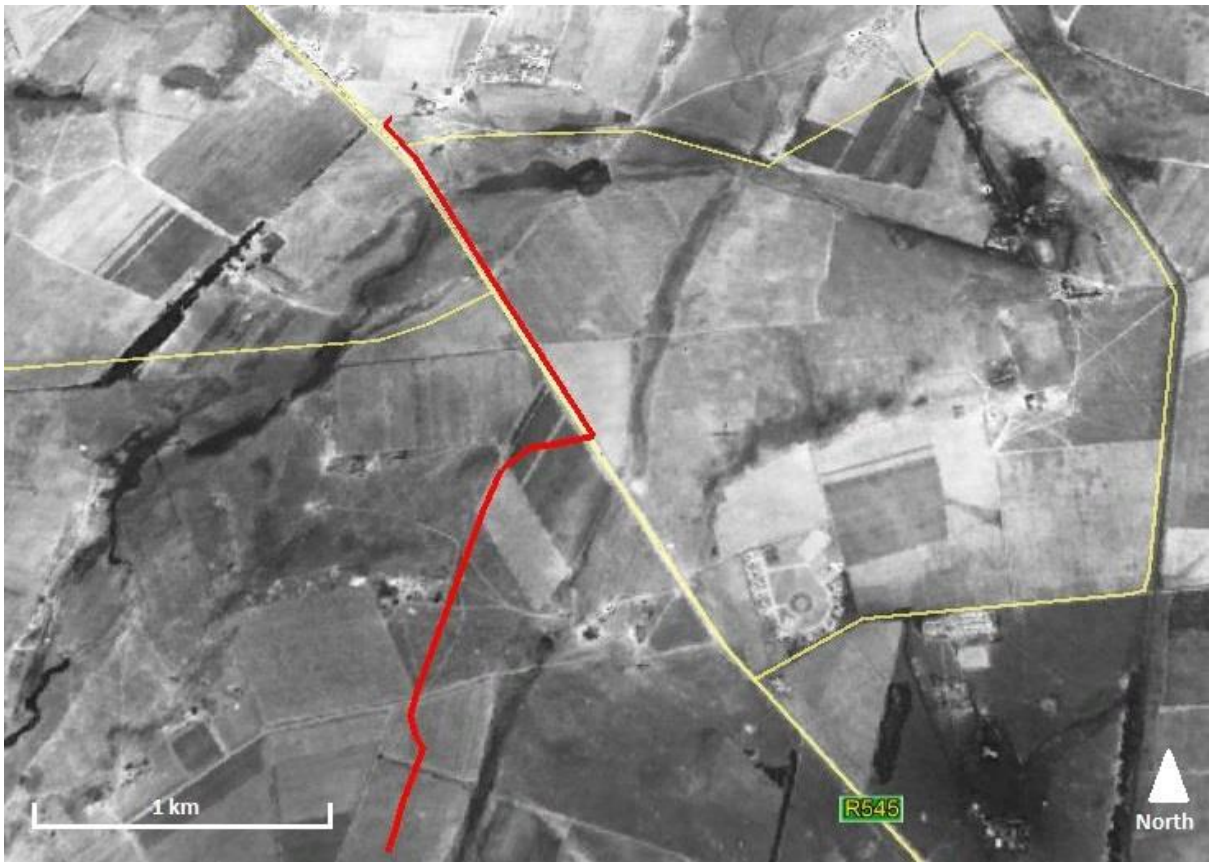

Figure 5-7: Historical imagery (1954) for the proposed pipeline routing development footprint, which is indicated in red

5.4 Sensitivity of the Site

Palaeontologically sensitive layers, as described in Section 5.2.1, underlie the proposed development footprint. Based on the understanding of the Project, i.e. a pipeline, with superficial disturbance to the surface, no impact to the palaeontological layers is envisaged.

Recorded heritage resources within proximity to the proposed routing occur outside of the development footprint (refer to Plan 4 in Appendix C). No new heritage resources within the development footprint were identified during the pre-disturbance survey. There are therefore no sensitivities associated with cultural heritage.

6 Impact Assessment

This report considered the potential impacts that may be caused through the construction and the operation of the proposed pipeline. No heritage resources were identified within the site-specific study area and therefore no direct impact to heritage resources is envisaged. No surface outcrops of the palaeontologically significant layers described in Section 5.2.1 were identified during the pre-disturbance survey. The Project is understood to have superficial surface disturbance. It is therefore unlikely that the Project will impact on the palaeontologically-sensitive layers of the *Vryheid Formation*.

6.1 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 mining operations and planned developments in line with the strategic development plans for Mpumalanga requires consideration to identify the possible in-combination effects of various impacts to known heritage resources. The possible cumulative impacts of the Project are presented in Table 6-1.

Table 6-1: Summary of potential cumulative impacts

Type	Cumulative Impact	Direction of Impact	Extent of Impact
Additive	The construction of the proposed pipeline will add to the existing body of mining infrastructure in the area and will add to the degradation of the sense of place of the cultural landscape.	Negative	Local

6.2 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* HCI Coal in terms of implementation of the Project. These two aspects are discussed separately.

No heritage resources were identified during the pre-disturbance survey. In the event that heritage resources are subsequently identified, and where HCI Coal knowingly does not take proactive management measures, potential risks to HCI Coal may include litigation in terms of Section 51 of the NHRA and social or reputational repercussions. A summary of the primary risks that may arise for HCI Coal is presented in Table 6-2.

Table 6-2: Identified heritage risks that may arise for HCI Coal

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 SAHRA and/or MPRHA in terms of Section 38(8).
Impacting on heritage resources formally and generally	Fines

Description	Primary Risk
protected by the NHRA without following due process. Due process may include social consultations and/or permit application processes to SAHRA and/or MPRHA.	Penalties Seizure of Equipment Compulsory Repair / Cease Work Orders Imprisonment

In the event that heritage resources are identified during construction of the pipeline, potential risks to those heritage resources will need to be assessed.

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Accidental exposure of fossil bearing material during implementation of the Project	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA	Establish Project-specific Chance Find Protocols (CFPs) as a condition of authorisation.
Accidental exposure of *in situ* MSA and LSA accumulations during implementation of the Project		
Accidental exposure of *in situ* LFC settlement sites during the implementation of the Project		
Accidental exposure of *in situ* historical built environment sites during the implementation of the Project	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA	
Accidental exposure of *in situ* 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 Mitigation and management measures

No impacts were considered and therefore no mitigation or management measures to avoid direct impacts to heritage resources are recommended. A CFP and a Fossil CFP must be developed and included in the EMP to mitigate any identified low risks or unplanned events if they manifest.

8 Monitoring requirements

No heritage resources were identified within or in proximity to the development footprint; therefore no specific monitoring requirements have been stipulated.

9 Identified heritage impacts versus socio-economic benefit

The site-specific study area falls within the Emalahleni Local Municipality in the Nkangala District Municipality. Within the district municipality, mining is a significant contributor to the Gross Value Added by Region (GVA-R), contributing 40.8% in 2015 (Nkangala District Municipality, 2017). Mining is a significant industry within the Emalahleni Local Municipality, contributing almost 60% to the Gross Value Add (GVA) within Nkangala District Municipality.

Unemployment within the Nkangala District Municipality remains a challenge. As of 2011, 42.8% of the total population within the municipality was recorded as unemployed and a further 11.9% were recorded as being “discouraged work seekers” (Nkangala District Municipality, 2017). Table 9-1 below summarises the statistics for the Emalahleni Local Municipality specifically (Statistics South Africa, 2011).

Table 9-1: Summary of employment statistics for the Emalahleni Local Municipality (adapted from Statistics South Africa, 2011).

Population (2011)	Emalahleni Local Municipality	
Total population	395 466	-
Working age (15-64)	281 572	71.2%
Reported unemployment rate	-	27.3%
Employed	138 548	49.2%
Unemployed	52 114	18.5%
Discouraged work seeker	9 612	3.4%
Economically not active	81 494	28.9%

Unemployment is especially problematic within the working or economically active youth (i.e. members of the population aged between 15 and 34 years). Economic development and job creation are therefore major themes in the Integrated Development Plan (IDP) of Nkangala District Municipality. To this end, the aims and objectives of the IDP include skills development and skills transfer in a number of outreach exercises to empower the youth and provide opportunities for employment.

The pipeline proposed by Mbali Colliery is not expected to increase the LoM. However, the operation of the pipeline will extend beyond the LoM as Mbali proposes to source coal from other mines in the region and incorporate this into their current coal washing system. This proposal would enable retention of part of the current employed workforce, at a minimum. Mbali and increased job security for that workforce. Mbali Colliery would also be able to continue contributing to the GVA of the Emalahleni Local Municipality and the GVA-R of the Nkangala District Municipality.

Mbali Colliery currently sells coal for the metallurgy and electricity-producing industries. Eskom specifically obtains coal from Mbali to generate power for the national grid. The National Development Plan has included electricity security as a milestone and aims to "Produce sufficient energy to support industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third" by 2030 (National Planning Commission, 2012). Mbali Colliery would therefore be able to reliably continue its contribution to the national electricity supply through the construction and operation of this pipeline.

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 risks to heritage resources. The following points support this statement:

- No heritage resources were identified during the pre-disturbance survey and therefore no impacts are foreseen;
- The proposed pipeline will allow the Mbali Colliery to continue its role as an economic contributor within the local and district municipality and contribute to employment and job security; and
- The proposed pipeline will also allow the Mbali Colliery to continue contributing electricity security indirectly, through the sale of coal to Eskom.

10 Reasoned opinion of the specialist

No heritage resources were identified within the proposed development footprint. To this effect, no direct impacts to heritage resources are envisaged. The site-specific study area is underlain by palaeontologically sensitive layers. However, through Digby Wells' understanding of the Project, it is unlikely that any impact to these layers should arise.

It is recommended that a CFP and a Fossil CFP be developed and implemented for Mbali Colliery. Where these recommendations are adopted, Digby Wells does not object to the authorisation and implementation of the Project from a heritage perspective.

11 Public Consultation

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. No such informal consultation was undertaken during this study.

Furthermore, this report was undertaken prior to the commencement of the regulated Stakeholder Engagement Process (SEP). Any heritage specific comments received during the SEP will be considered in the Comments and Response Report and submitted to SAHRA and MPRHA via SAHRIS.

12 Conclusion

This report was compiled to promote compliance with the requirements encapsulated in GN R 983 Appendix 1 Subsections 2(d) and 3(1)(h)(iv) and (vii) as well as Section 38(8) of the NHRA. This HBAR considered the baseline cultural environment within a local and regional study area to provide context for tangible heritage resources that may be identified within the site-specific study area and which may be impacted upon by the construction of the proposed pipeline between the TWRP and Mbali Colliery. No alternatives to the Project were considered in this assessment: the only alternative to the Project would be the 'No-Go' option. This would result in the current *status quo* remaining intact.

The regional and local study areas are predominantly associated with burial grounds and graves, and the Historical Built Environment to a lesser extent. Within the development footprint, no heritage resources were identified, therefore no direct impacts to heritage resources are envisaged, and consequently no mitigation or management measures are proposed. It is, however, recommended that a Chance and Fossil Finds Procedure be developed and implemented as a condition of authorisation.

Based on the findings of this HBAR, Digby Wells is of the opinion that no heritage resources will be impacted and therefore does not object to the implementation of the Project from a heritage perspective.

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Van Vollenhoven, A., 2015a. *A report on a Cultural Heritage Impact Assessment for the proposed Hope No. 4 Seam Mining Project, clode to Kriel, Mpumalanga Province,* Archaetnos Culture and Cultural Resource Consultants: Unpublished report prepared for Geivicon.

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Van Vollenhoven, A., 2017. *A report on a Cultural Heritage Impact Assessment for a proposed underground mine on different portions of the Farm Schurvekop 227 ID, close to Bethal, Mpumalanga Province,* Archaetnos Culture and Cultural Resources Consultants: Unpublished report prepared for Cabanga Environmental.

Van Vollenhoven, A. C., 2014a. *A report relating to the Heritage Impact Assessment (HIA) for the Exxaro Matla Colliery stooping pillars of the underground works, near Kriel in the Mpumalanga Province (updated),* Archaetnos Culture & Cultural Resource Consultants: Unpublished report prepared for GCS.

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Willsworth, C., 2006. *Bakenlaagte - the Story.* Durban: Just Done Productions.

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.

Appendix A: Specialist CV

Mr. Justin du Piesanie

Manager: Heritage Resources Management

Social and Heritage Services Department

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
2016 to present	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 and was subsequently made unit manager in the Social and Heritage Services Department in 2016. 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, the Democratic Republic of Congo, Liberia and Mali 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. My 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.

5 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005	2006	Archaeological surveys	ARM
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006	2006	Phase 2 Mapping	Sun International
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007	2007	Archaeological survey	ARM
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008	2008	Heritage Basic Assessment	ARM
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008	2008	Heritage Impact Assessment	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
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009	2009	Phase 2 Excavations	Heritage Contracts Unit
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009	2009	Phase 2 Mapping	University of the Witwatersrand
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 Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Heritage Statement	Strategic Environmental Focus
Batlhako Mine Expansion	North-West Province, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011	2013	Grave Relocation	Randgold Resources Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012	2014	Heritage Impact Assessment	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
SEGA Gold Mining Project	Burkina Faso	2012	2013	Socio Economic and Asset Survey	Cluff Gold PLC
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2015	Heritage Impact Assessment	Aquarius Resources
SEGA Gold Mining Project	Burkina Faso	2013	2013	Technical Reviewer	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013	2013	Heritage Impact Assessment	Msobo
New Liberty Gold Project	Liberia	2013	2014	Grave Relocation	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013	2013	Heritage Scoping	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013	2014	Heritage Impact Assessment	Atkins Limited
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013	2014	Notification of Intent to Develop	ERM Southern Africa
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013	2013	Heritage Impact Assessment	ERM Southern Africa
Exxaro Belfast GRP	Belfast, Mpumalanga, South Africa	2013	-	Grave Relocation	Exxaro Coal Mpumalanga (Pty) Ltd
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014	2014	Social consultation	Randgold Resources Limited
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	Ergo (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014	2014	Heritage Basic Assessment	Ergo (Pty) Ltd
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014	2014	Heritage Impact Assessment	Randgold Resources Limited
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014	2014	Gap analysis	Gold One International
Yzermite PIA	Wakkerstroom, Mpumalanga, South Africa	2014	2014	Palaeontological Assessment	EcoPartners
Sasol Mooikraal Basic Assessment	Sasolburg, Free State, South Africa	2014	2014	Heritage Basic Assessment	Sasol Mining
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014	2015	Heritage Impact Assessment	Oakleaf Investment Holdings
Rea Vaya Phase II C Project	Johannesburg, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	ILISO Consulting
Imvula Project	Kriel, Mpumalanga, South Africa	2014	2015	Heritage Impact Assessment	Ixia Coal
Sibanye WRTRP	Gauteng, South Africa	2014	2016	Heritage Impact Assessment	Sibanye
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014	2015	Heritage Impact Assessment	VM Investment Company
NLGM Constructed Wetlands Project	Liberia	2015	2015	Heritage Impact Assessment	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 Impact Assessment	Jindal
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Destruction Permit Application	Bigen Africa Services (Pty) Ltd
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Permit Application	Bigen Africa Services (Pty) Ltd
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Groningen and Inhambane PRA	Limpopo Province, South Africa	2016	2016	Heritage Basic Assessment	Rustenburg Platinum Mines Limited

Project Title	Project Location	Date:		Description of the Project	Name of Client
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014	2016	Technical Review	IMIC plc
Palmietkuilen MRA	Springs, Gauteng, South Africa	2016	2016	Heritage Impact Assessment	Canyon Resources (Pty) Ltd
Copper Sunset Sand Mining S.102	Free State, South Africa	2016	2016	Heritage Basic Assessment	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 Basic Assessment	Eskom Holdings SOC Limited
Grootegeluk Amendment	Lephalale, Limpopo Province, South Africa	2016	2016	Notification of Intent to Develop	Exxaro
Garsfontein Township Development	Pretoria, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Leungo Construction Enterprises
Massawa EIA	Senegal	2016	2017	Technical Reviewer Heritage Impact Assessment	Randgold Resources Limited
Louis Botha Phase 2	Johannesburg, Gauteng, South Africa	2016	2016	Phase 2 Excavations	Royal Haskoning DHV
Beatrix EIA and EMP	Welkom, Free State, South Africa	2016	2017	Heritage Impact Assessment	Sibanye Gold Ltd
Sun City Heritage Mapping	Pilanesberg, North-West Province, South Africa	2016	2016	Phase 2 Mapping	Sun International
Sun City Chair Lift	Pilanesberg, North-West Province, South Africa	2016	2017	Notification of Intent to Develop and Heritage Basic Assessment	Sun International
Hendrina Underground Coal Mine EIA	Hendrina, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Umcebo Mining (Pty) Ltd
Elandsfontein EMP Update	Clewer, Mpumalanga, South Africa	2016	2017	Heritage Impact Assessment	Anker Coal
Eskom Northern KZN Strengthening	KwaZulu-Natal, South Africa	2016	-	Heritage Impact Assessment	ILISO Consulting
Thabametsi GRP	Lephalale, Limpopo Province, South Africa	2017	-	Grave Relocation	Exxaro Resources Ltd
Grootegeluk Watching Brief	Lephalale, Limpopo Province, South Africa	2017	2017	Watching Brief	Exxaro Resources Ltd
Matla HSMP	Kriel, Mpumalanga Province, South Africa	2017	2017	Heritage Site Management Plan	Exxaro Coal Mpumalanga (Pty) Ltd
Ledjadja Coal Borrow Pits	Lephalale, Limpopo Province, South Africa	2017	2017	Heritage Basic Assessment	Ledjadja Coal (Pty) Ltd
Exxaro Belfast Implementation Project PIA	Belfast, Mpumalanga, South Africa	2017	2017	Palaeontological Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

Project Title	Project Location	Date:		Description of the Project	Name of Client
Lanxess Chrome Mine Archaeological Mitigation	Rustenburg, North West Province, South Africa	2017	2017	Phase 2 Excavations	Lanxess Chrome Mine (Pty) Ltd
Goulamina EIA Project	Goulamina, Sikasso Region, Mali	2017	2017	Heritage Impact Assessment	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	Orientale Province, Democratic Republic of Congo	2017	-	Grave Relocation	Randgold Resources Limited
Exxaro Matla HRM	Kriel, Mpumalanga	2017	-	Heritage Impact Assessment	Exxaro Coal Mpumalanga (Pty) Ltd

6 Professional Registrations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
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)

Miss Shannon Hardwick

Assistant Heritage Resources Management Consultant

Social and Heritage Services Department

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
2017 to present	Digby Wells Environmental	Intern: Heritage Resources Management
2016-2017	Tarsus Academy	Facilitator
2011-2016	University of the Witwatersrand	Teaching Assistant
2011	University of the Witwatersrand	Collections Assistant

4 Experience

I joined the Digby Wells in April 2016 as an archaeologist. I joined Digby Wells as a Heritage Resources Management intern in the Social and Heritage Services Department and have subsequently been appointed as an Assistant Consultant. I received my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2010, specialising in archaeobotany and historical archaeology in the Limpopo Province. I have fieldwork experience in historical archaeology as well as in Stone Age archaeology in South Africa. My fieldwork experience at Digby Wells includes pre-disturbance surveys in South Africa and fieldwork in Malawi. I have gained generalist experience through the compilation of Notification of Intent to Develop (including Request for Exemption) applications, cultural baselines and Heritage Impact Assessments. I have compiled a Community Health, Safety and Security Plan and I have been involved in researching Artisanal and Small-Scale Mining (ASM) in Senegal for input into a Livelihood Restoration Framework (LRF).

5 Project Experience

My project experience is listed in the table below:

Project Title	Project Location	Date:	Description of the Project	Name of Client
Zuurfontein NID	Ekurhuleni, Johannesburg, South Africa	July 2017	Notification of Intent to Develop	Shuma Africa Projects
Liwonde Additional Studies	Liwonde, Southern Region, Malawi	July 2017	Resettlement Action Plan.	Mota-Engil

Project Title	Project Location	Date:	Description of the Project	Name of Client
National Heritage Resources Act, 1999 (Act No. 25 of 1999) Section 35 Archaeological Investigations, Lanxess Chrome Mine, North-West Province	Rustenburg, North West Province, South Africa	July 2017	Phase 2 Mitigation Assessment	Lanxess Chrome Mines (Pty) Ltd
Environmental and Social Input for the Pre-Feasibility Study	Bougouni, southern Mali	July 2017	Pre-Feasibility Study	Birimium Gold
Environmental Fatal Flaw Analysis for the Mabula Filling Station	Waterberg, Limpopo Province, South Africa	November 2017	Fatal Flaw Analysis	Mr van den Bergh
Basic Assessment and Environmental Management Plan for the Proposed pipeline from the Mbali Colliery to the Tweefontein Water Reclamation Plant, Mpumalanga Province	Mpumalanga Province, South Africa	Ongoing	Heritage Basic Assessment Report	HCI Coal (Pty) Ltd (Mbali Colliery)

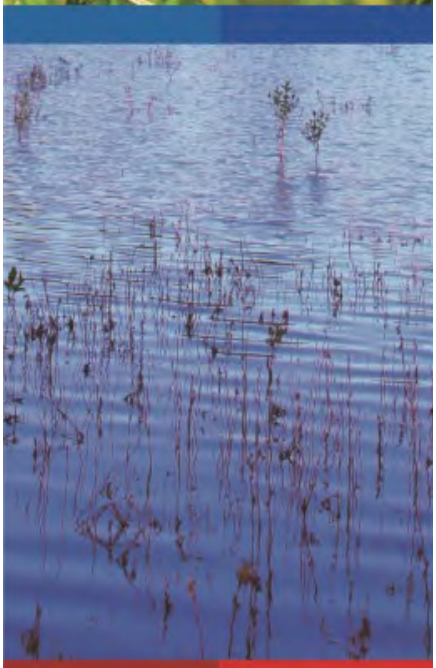
6 Professional Registrations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA)	451

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.

Appendix B: Impact Assessment Methodology



DIGBY WELLS
ENVIRONMENTAL

Heritage Cultural Significance, Field Rating and Impact Assessment Methodology

Assessment Methodology Statement

Project Number:

ZZZ9999

Prepared for:

Internal Document

June 2016

Digby Wells and Associates (South Africa) (Pty) Ltd
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This document has been prepared by Digby Wells Environmental.

Document:	**Assessment Methodology Statement**
Description:	**Heritage Cultural Significance, Field Rating and Impact Assessment Methodology**
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	HRM Manager	Ver 4	January 2016
		Ver 5	June 2016

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Introduction

Assessment of impacts include several steps aimed to evaluate the way in which environmental aspects will / may interact with the cultural landscape (*the environment*) resulting in environmental impacts to heritage resources. Environmental aspects and impacts are defined as:

- Environmental aspects: an element of an organisation's activities or products or services that can interact with the environment' (ISO 14001: 2004 - 3.6); and
- Environmental impacts: any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO 14001: 2004 - 3.7).

However, in terms of cultural heritage resources, environmental impacts should be assessed relative to the heritage value or cultural significance of a resource. The methodology employed in the various stages of the impact assessment process is described in more detail below.

2 Evaluation of Cultural Significance

The significance rating process is designed to provide a numerical rating of the cultural significance[1] of identified heritage resources. The evaluation was done as objectively as possible through a matrix developed by Digby Wells for this purpose. In addition, the methodology aims to allow ratings to be reproduced independently should it be required, provided that the same information sources are used.

Dimension		Attributes considered	NHRA Ref.
Aesthetic & technical	1	Importance in aesthetic characteristics	S.3(3)(e)
	2	Degree of technical / creative skill at a particular period	S.3(3)(f)
Historical importance & associations	3	Importance to community or pattern in country's history	S.3(3)(a)
	4	Site of significance relating to history of slavery	S.3(3)(i)
	5	Association with life or work of a person, group or organisation of importance in the history of the country	S.3(3)(h)
Information potential	6	Possession of uncommon, rare or endangered natural or cultural heritage aspects	S.3(3)(b)
	7	Information potential	S.3(3)(c)
	8	Importance in demonstrating principle characteristics	S.3(3)(d)
Social	9	Association to community or cultural group for social, cultural or spiritual reasons	S.3(3)(g)

Box 1: NHRA section 3 criteria

This matrix takes into account heritage resources assessment criteria set out in subsection 3(3) of the NHRA (see Box 1), which determines the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review

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

of available credible sources and representivity or uniqueness (i.e. known examples of similar resources to exist). The final significance attributed to a resource furthermore takes into account the physical integrity of the fabric of the resource. The formula used to determine significance can is summarised in Box 2.

Value = Importance x Integrity

where

Importance = average sum

of

Aesthetic + Historic + Scientific + Social

Box 2: CS formula

The rationale behind the heritage value matrix takes into account the fact that a heritage resource's value is a direct indication of its sensitivity to change (impacts). Value therefore needs to be determined prior to the completion of any assessment of impacts.

This matrix rates the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social.

The significance of a resource is directly related to the impact on it that could result from project-related activities, as it provides minimum accepted levels of change to the resource. SAHRA has published minimum standards that include minimum required mitigation of heritage resources. These minimum requirements are integrated into the matrix to guide both assessments of impacts and recommendations for mitigation and management of resources.

The weight assigned to the various parameters for significance in the formula, significance ratings and recommended mitigation are presented in Table 3-1.

3 Field Rating

Although grading of heritage resources remains the responsibility of heritage resources authorities, SAHRA requires in terms of its Minimum Standards that heritage reports include Field Ratings for identified resources to comply with section 38 of the NHRA. The NHRA in terms of section 7 provides for a system of grading of heritage resources that form part of the national estate, distinguishing between three categories.

The field rating process is designed to provide a numerical rating of the recommended grading of identified heritage resources. The evaluation was 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. The formula used to determine field ratings is summarised in Box 3. The weight assigned to the various field rating parameters in the formula and the sum of the average ratings are is presented in Table 3-1.

Field Rating = average sum

of

Aesthetic + Historic + Scientific + Social

Box 3: Field rating formula

Table 3-1: Ratings and descriptions used in determining CS and field ratings

Rating	IMPORTANCE *A heritage resource's contribution to aesthetic, historic, scientific and social value.*	INTEGRITY *The undivided or unbroken state, material wholeness, completeness or entirety of a resource or site*	FIELD RATING *Recommended grading of identified heritage resources in terms of NHRA Section 7*
-	Not assessed - dimension and/or attribute not considered in determining value.		Not assessed - dimension and/or attribute not considered in field rating.
0	The resource exhibits attributes that may be considered in a particular dimension, but it is so poorly represented that it cannot or does not contribute to the resource's overall value.	No information potential, complete loss of meaning, Fabric completely degraded, original setting lost	
1	Common, well represented throughout diverse cultural landscapes	Fabric poorly preserved, limited information, little meaning ascribed, extensive encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance Grade IV C
2	Generally well represented but exhibits superior qualities in comparison to other similar examples	Fabric is preserved, some information potential (quality questionable) and meaning evident, some encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance Grade IV B
3	The resource exhibits attributes that are rare and uncommon within a region. It is important to specific communities.	Fabric well preserved, good quality information and meaning evident, limited encroachment	Resources under general protection in terms of NHRA sections 34 to 37 with Medium to Medium-High significance Grade IV A
4	Rare and uncommon, value of national importance	Excellent preservation of fabric, high information potential of high quality, meaning is well established, no encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with High significance Grade III B
5	The resource exhibits attributes that are considered singular, unique and/or irreplaceable to the degree that its significance can be universally accepted.		Resources under general protection in terms of NHRA sections 34 to 37 with Very High significance Grade III A
6			Heritage resources under formal protection that can be considered to have special qualities which make them significant within the context of a province or a region Grade II
7			Heritage resources under formal protection that can be considered to have special qualities which make them significant within a national and / or international context. Grade I

4 Impact Assessment

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

- **Project Activity:** Activities associated with the project that result in an environmental interaction during the different phases (construction, operation and decommissioning), e.g., new processing plant, new stockpiles, development of open pit, dewatering, water treatment plant;
- **Interaction:** An "environmental interaction" is 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:** The term "environmental aspect" refers to the 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.
- **Environmental Impact:** An "environmental impact" is 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.

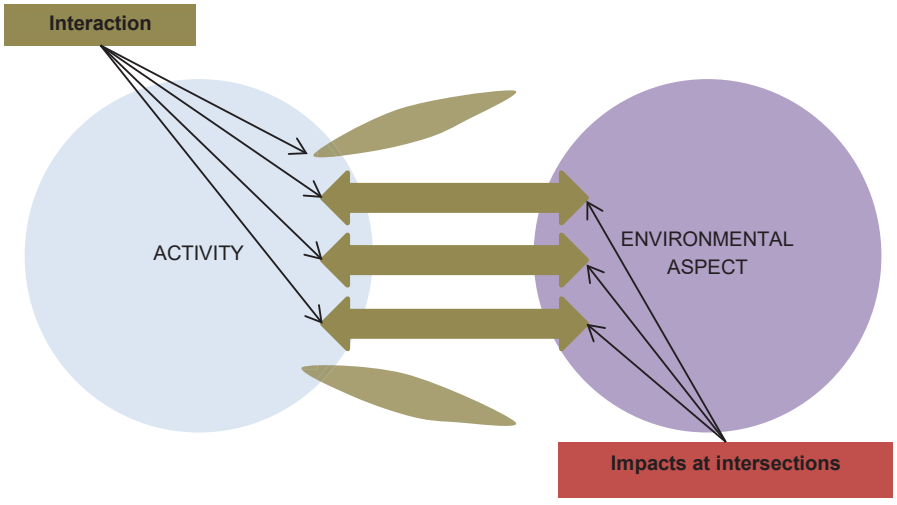

Figure 4-1: Graphical representation of impact assessment concept

The potential impacts were considered through an examination of the project phase and activity, the environmental aspect, the interdependencies between aspects, an assessment and classification of categories, and consideration of the potential impact on heritage resources. An example of this process is presented in Figure 4-2.

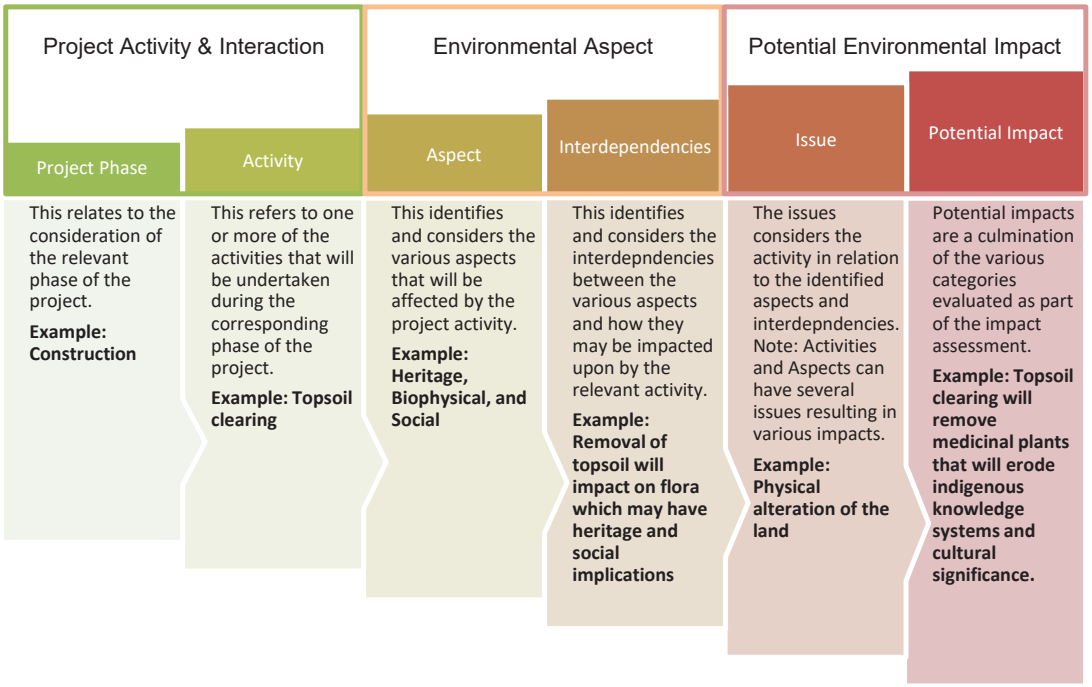

Figure 4-2: Example of how potential impacts were considered.

4.1 Defining Heritage Impacts

Different heritage impacts may manifest in different geographical areas and diverse communities. For instance, heritage impacts can simultaneously affect the physical resource and have social repercussions: this is compounded when the intensity of physical impacts and social repercussions differ significantly. In addition, heritage impacts can influence the cultural significance of heritage resources without any actual physical impact on the resources taking place. Heritage impacts can therefore generally be placed into three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary heritage impacts** affect the fabric or physical integrity of the 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.

- **Indirect, induced or secondary heritage impacts** can 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 cultural significance that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any primary impact, its significance is affected that can ultimately result in the loss of the resource itself.
- **Cumulative heritage impacts** 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:
  - **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 particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building high.
  - **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.
  - **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.

The relevance of the above distinction to defining the study areas in the HSR arises from the fact that heritage resources do not exist in isolation to the wider natural, social, cultural and heritage landscape: cultural significance is therefore also linked to rarity / uniqueness, physical integrity and importance to diverse communities.

In addition, the NHRA requires that heritage resources are graded in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Three ‘concentric’ study areas were defined for the purposes of this study and are discussed in detail in the HSR.

4.2 Impact Assessment

The impact rating process is designed to provide a numerical rating of the identified heritage impacts. The significance rating follows an established impact/risk assessment formula is shown in Box 4.

The weight assigned to the various parameters for positive and negative impacts in the formula is presented in Table 4-2 below.

Project-related impacts on heritage resources have taken into account the inherent value of heritage resources, described above, and only applied to resources with values above negligible. As a result, the impact assessment did not consider individual resources, but was applied to diverse resources grouped in terms of similar values.

The magnitude will then be applied to pre- and post-mitigation scenarios with the intention of removing all impacts on heritage resources. Where project related mitigation does not avoid or sufficiently reduce negative changes/impacts on heritage resources with high values, mitigation of these resources may be required. This may include alteration, restoration or demolition of structures under a permit issued by the HRAs.

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

where:

Consequence = type of impact x (Intensity + Spatial Scale + Duration)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

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

Box 4: Impact assessment formula

Impacts were rated prior to mitigation and again after consideration of the proposed mitigation measures. Impacts were then categories into one of eight categories listed in Table 4-2. The relationship between the consequence, probability and significance ratings is also graphically depicted in Table 4-2.

Table 4-1: Description of duration, extent, intensity and probability ratings used in impact assessment

Value	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 RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**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	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 RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**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 4-2: Impact significance ratings, categories and relationship between consequence, probability and significance

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)

Relationship between consequence, probability and significance ratings

Probability \ Significance	-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
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
Consequence	**-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**

5 Mitigation Measures and Recommendations

The desired outcome of an impact assessment is the removal of negative impacts on heritage resources through the implementation of feasible mitigation measures. The mitigation and management measures recommended in this section comply with the General Principles set out under section 5 of the NHRA. The recommendations further considered the cultural significance of heritage resources and were guided by the minimum mitigation contained in the SAHRA Minimum Standards (See Box 5).

Designation	Recommended mitigation
Negligible	Sufficiently recorded, no mitigation required
Low	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
Medium	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.
Medium High	Project design should aim to reduce or remove changes; Mitigation of resource to include extensive sampling and recording, e.g. test excavation, analyses, etc.
High	Project design must aim to avoid change to resource; Partly conserved, Conservation Management Plan (CMP)
Very High	Project design must change to avoid all change to resource; Conserved in entirety, CMP

Box 5: Recommended minimum level of required mitigation

Recommended mitigation is therefore divided into two categories: *project-related* and *mitigation of heritage resources* defined below.

- Project-related mitigation requires changes or amendments to project design, planning and siting of infrastructure to avoid or reduce physical impacts on heritage resources. Project-related mitigation measures are always the preferred option, especially where heritage resources with higher cultural significance will be impacted on. Project-related mitigation may include:
  - *In situ* preservation (i.e. no-development) of heritage resources for which Conservation Management Plans (CMPs) are required; and
  - Conservation of heritage resources through, for example, incorporating the resources into project design and planning, for which CMPs are also required.
- Mitigation of heritage resources may be necessary where project-related mitigation will not sufficiently reduce or remove impacts, thus resulting in partial or complete changes (including destruction) to a resource. Such resources need to be mitigated to ensure that they are fully recorded, documented and researched before any negative change occurs. This may require actions such as:
  - Intensive detailed recording of sites through various non-intrusive techniques to create a documentary record of the site – “preservation by record”;
  - 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 a regulated permitted activity for which permits need to be issued by

the relevant heritage authorities. Such mitigation may result in a reassessment of the value of a 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; and

- Where resources have negligible significance the specialist may recommend that no further mitigation is required and the site may be destroyed, for which a destruction permit must be applied for.

Appropriate mitigation measures were identified for each impact, and the procedure discussed above was to assess the possible consequence, probability and significance of each impact post-mitigation.

The post-mitigation rating provided an indication of the significance of residual impacts, while the difference between an impact's pre- and post-mitigation ratings represents the degree to which the recommended mitigation measures are expected to be effective in reducing or ameliorating that impact.

Appendix C: Maps and Plans

1. Regional Setting Plan
2. Local Setting Plan
3. Regional Geology
4. Heritage Survey

Plan 1

Glencore Mbali Pipeline

Regional Setting

Legend

- Mbali Colliery
- Goedgevonden Mine
- Proposed Mbali Pipeline
- City
- Major Town
- Secondary Town
- Other Town
- Settlement
- Arterial/National Road
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- District Municipality (2016)
- Affected District Municipality
- Local Municipality (2016)
- Affected Local Municipality

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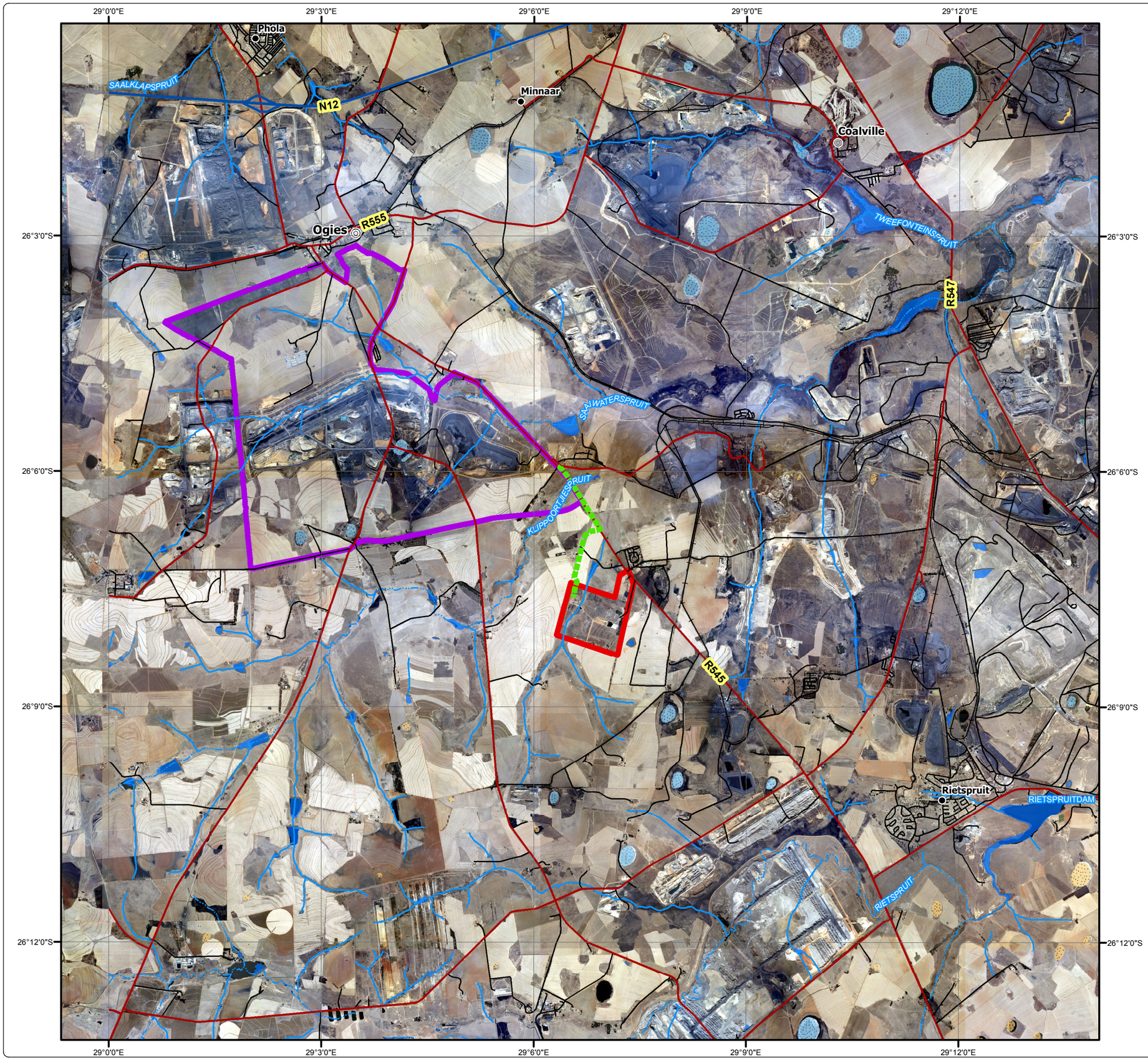
Plan 2

Glencore Mbali Pipeline

Local Setting



Legend

- Mbali Colliery
- Goedgevonden Mine
- Proposed Mbali Pipeline
- Secondary Town
- Other Town
- Settlement
- Arterial/National Road
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan

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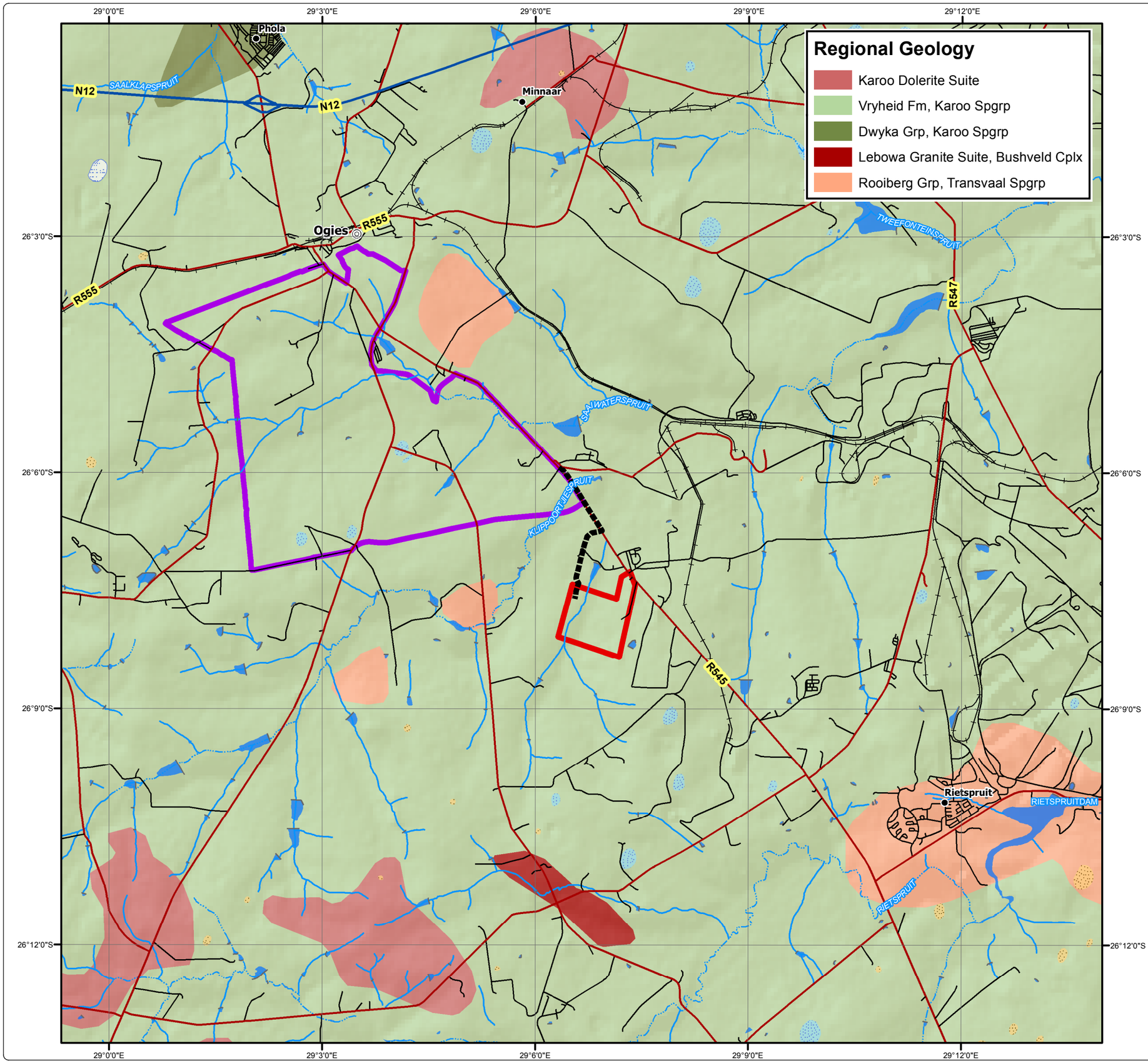
Plan 3

Glencore Mbali Pipeline

Regional Geology



Legend

- Mbali Colliery
- Goedgevonden Mine
- Proposed Mbali Pipeline
- Secondary Town
- Other Town
- Settlement
- Arterial/National Road
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan

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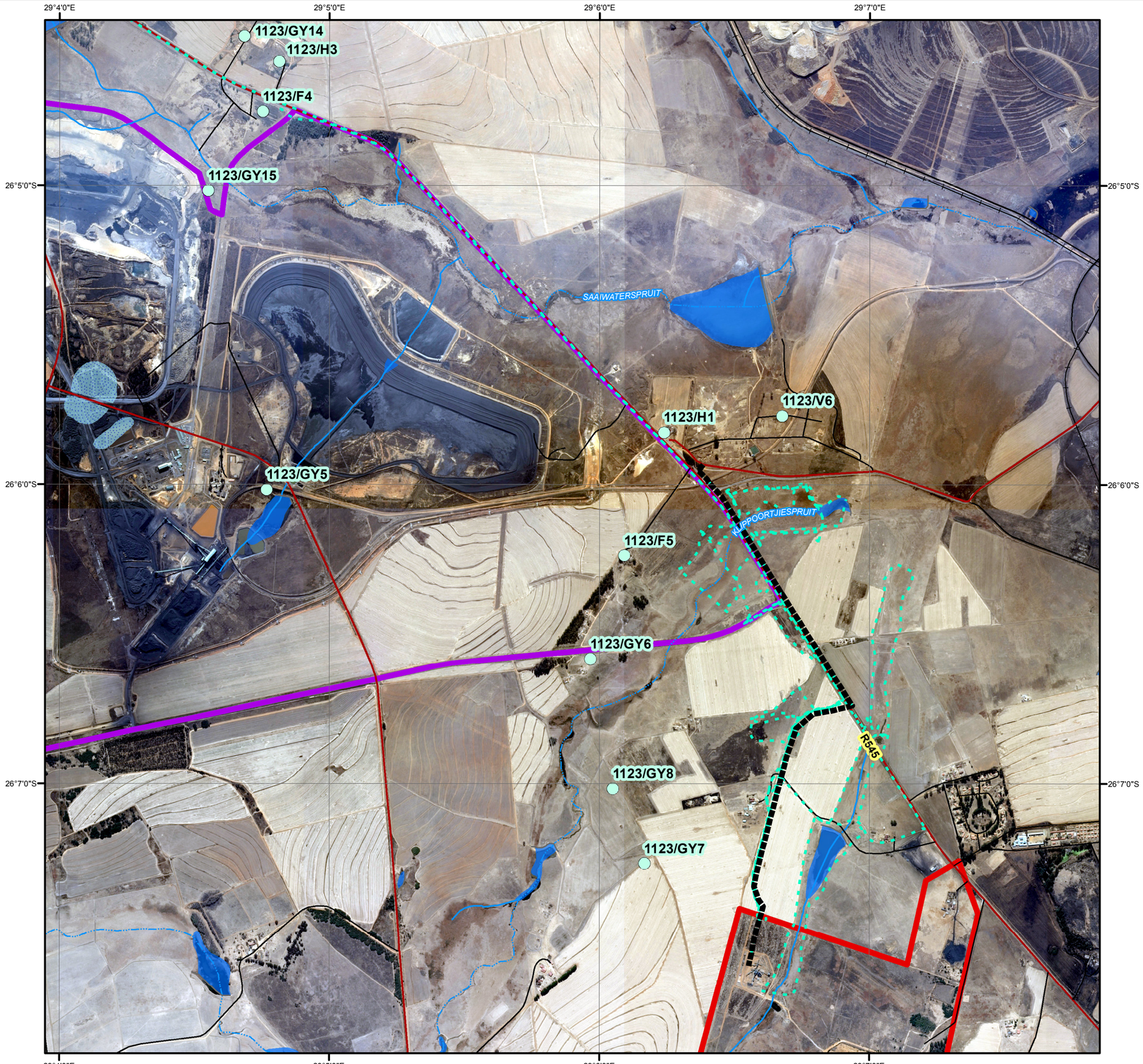
Plan 4

Glencore Mbali Pipeline

Identified Heritage Resources



Legend

- Mbali Colliery
- Goedgevonden Mine
- Proposed Mbali Pipeline
- Identified Heritage Resource
- Site Visit Track
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Perennial Pan

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