



HERITAGE STATEMENT FOR THE SASOL MINING SIGMA COLLIERY ASH BACKFILLING PROJECT, SASOLBURG, FREE STATE PROVINCE

SASOL MINING (PTY) LTD





15 November 2013



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Report Title: **Heritage Statement for the Sasol Mining Sigma Colliery
Ash Backfilling Project, Sasolburg, Free State Province**

Project Number: **SAS1691**

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EXECUTIVE SUMMARY

Introduction

Sasol Mining (Pty) Ltd (Sasol) proposes to undertake a project which involves the backfilling of old underground voids in the northern defunct area at the Sigma Colliery with ash. This is intended to mitigate risk associated with subsidence of the surface caused by historical underground mining activity at Sigma. The ash backfilling process will utilise several pipelines located above ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station to the underground voids. The return water pipelines will be used to abstract water from the mine voids to create space for backfilling.

In order to comply with Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) a Heritage Statement Report (HSR) in support of a Notification of Intent to Develop (NID) was compiled detailing the current cultural landscape and possible sources of risk to cultural heritage resources.

Project Background

Sasol's Sigma Colliery commenced operations in 1952 and holds mineral rights to coal deposits in the Sasolburg district. Underground mining was the primary method of extracting these reserves including board-and-pillar, rib pillar, long wall and high extraction methods. Access to the underground operations was via several shafts, and then conveyed to a 'dry' coal handling plant at 3 Shaft where the coal was screened and fed to silos. In 1992, the Wonderwater and Mohlolo strip mines were developed to extract coal from the north-eastern side of the reserves and the underground mining was scaled down and ceased by 1999.

The proposed project is aimed at backfilling additional high risk mine voids with ash from Infrachem. The project will be undertaken in order to stabilise old underground mine workings which are considered to have a high potential risk for land subsidence.

The pipelines transporting slurry will run aboveground on Sasol owned property and within existing servitudes where possible. Where this is not possible, existing culverts and crossings will be used; alternatively new agreements will be entered into with land owners. The pipeline route will be specifically selected to ensure that the pipes run along existing servitudes, linear infrastructure and disturbed areas to minimise the impact on the receiving environment.

Current Project Status

Sigma Colliery has applied for the following authorisations required for identified listed activities relevant to the backfilling project and the construction and operation of the proposed infrastructure

- An integrated Environmental Authorisation through a Basic Assessment in terms of the National Environmental Management Act, (Act No. 107 of 1998) (NEMA);
- A waste licence through a Social and Environmental Impact Assessment (S&EIA) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA); and
- An integrated Water Use Licence Application (IWULA) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Regional Location

Province	Free State
Magisterial district	Sasolburg
District municipality	Fezile Dabi District Municipality
Local municipality	Metsimaholo Local Municipality
Nearest town	Sasolburg
1: 50 000 topographic map sheets	2627DA, DB, DC & DD
Relative centre coordinates of site / project area	26.811244° S 27.789468° E
Recording method	Google Earth

Receiving Environment / Cultural Landscape

The project area is situated in the Sasolburg-Vereeniging Coal Field which forms part of the Karoo Basin. The Karoo Basin is divided into the Dwyka, Eccca and Beaufort Groups. The rocks of the Vryheid formation of the Eccca Group are renowned for their wealth of plant fossils of the famous Gondwanan *Glossopteris* flora which has been described from the Permian aged-rocks. This flora is the source of the coal which is mined from the Vryheid Formation in South Africa. Important plant fossil localities have previously found in areas close to Vereeniging.

The current cultural landscape is primarily agriculture with large parts having been altered by industry and mining. Agricultural activities would have, over the years, destroyed most archaeological resources that may have been present. Open cast mining and rehabilitation of sites would further have destroyed any viable archaeological sites and palaeontology that may have existed pre-1999 and before the NHRA came into effect. The entire area, underlain by the Vryheid Formation, which will be crossed by proposed pipelines required for the ash backfilling, is devoid of rock outcrops and is covered by either grassland or by ploughed fields. It is thus very unlikely that any fossil heritage will be damaged by activities relating to the ash backfilling.

In addition, urban sprawls along the Vaal River banks have significantly reduced the potential of identifying Stone Age sites there. No historical built environment resources, townscapes or burial grounds were noted during the screening assessment, but any impact to such resources by the proposed project would be negligible. The impact due to subsidence on these resources would be far greater.

A review of 13 heritage reports relevant to the Sigma Colliery project area further indicated that typical heritage resources occurring in the region are historical structures and burial grounds with relatively low significance. There are exceptions such as the Leeuwkuil engraving site and Iron Age stonewalled settlements. However, none of the reviewed reports explicitly addressed intangible heritage, including landscape character and sense of place. This omission is contrasted by the Fezile Dabi Integrated Development Plan (FD-IDP) that refers to the importance of heritage (with a bias towards intangible and liberation heritage) in the district as beneficial to tourism and good governance.

Sources of Risk

No sources of risk to heritage resources were identified in relation to the construction, operational and decommissioning phases of the Sigma Colliery ash backfilling project:

- The project proposes to either recommission or upgrade existing pipelines and install similar pipes where required. The construction of the pipelines will be low-impact as the pipes will be above ground. The main intrusive activity will be the construction of concrete plinths to support the pipeline where required;
- As most pipelines are within existing servitudes or along farm boundary lines, construction of access roads will not be required. Where access may be necessary it will merely entail bush or surface vegetation clearing in already disturbed areas;
- The construction methods are furthermore of such a nature that should any heritage resource (e.g. a burial ground) be encountered, the pipeline route may be deviated to avoid any direct impact on a site; and
- The proposed project is also not expected to impact or change the character of the landscape or sense of place. In fact, the potential risk of subsidence should be seen as a greater risk.

Recommendations

Given the current state of the cultural landscape, the apparent absence of any significant tangible heritage resource and the limited impact of the proposed Sigma Colliery ash backfilling project, the following recommendations are made:

- The South African Heritage Resources Agency (SAHRA) and the Free State Provincial Heritage Authority (FSPRHA) must consider granting Sasol Mining exemption from a Heritage Impact Assessment (HIA) inclusive of all complementary specialist studies, for the Sigma Colliery ash backfilling project;
- If granted the exemption should however be subject to periodic monitoring of the construction of the pipeline and ash backfilling activities to ensure that heritage resources are avoided if present;
- It must also explicitly be stated that if exemption is granted, it only applies to the Sigma Colliery project as described in this report – any additional work or deviations may be subject to additional heritage studies; and
- In the event that any heritage resources are accidentally found during the course of the project, work must cease and appropriate Chance Find Procedures (CFPs) must be implemented.

GLOSSARY OF ABBREVIATIONS AND TERMS

NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
HSR	Heritage Statement Report
NID	Notification of Intent to Develop
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
IWULA	Integrated Water Use Licence Application
FD-IDP	Fezile Dabi Integrated Development Plan
SAHRA	South African Heritage Resources Agency
FSPHRA	Free State Provincial Heritage Resources Authority
HIA	Heritage Impact Assessment
CFPs	Chance Find Procedures
HRA	Heritage Resources Authority
I&APs	Interested and Affected Parties
MLM	Metsimaholo Local Municipality
FDDM	Fezile Dabi District Municipality
KPA	Key Performance Area
CE	Common Era
MSA	Middle Stone Age
LSA	Later Stone Age

TABLE OF CONTENTS

1	INTRODUCTION	1
2	BACKGROUND INFORMATION OF PROJECT	1
2.1	Project Description	2
2.2	Current Project Status	3
2.3	Relevant Contact Details	3
2.4	Statutory Requirements	9
2.4.1	<i>National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)</i>	9
2.5	Scope of Work	11
3	METHODOLOGY	12
3.1	Literature Review	12
3.2	Historical Layering	12
3.3	Heritage Screening Assessment	12
3.4	Summary of Public Participation	12
4	STATE OF THE RECEIVING ENVIRONMENT/CULTURAL LANDSCAPE	13
4.1	General Description of Affected Environment	13
4.1.1	<i>Vegetation</i>	14
4.1.2	<i>Rezoning and / or Land Subdivision</i>	16
4.1.3	<i>Development Context of Study Area</i>	16
4.2	Literature Review	19
4.2.1	<i>Geological Character and Palaeontological Potential</i>	19
4.2.2	<i>Early to Later Stone Age (c. 2.5 mya to 1st millennium CE)</i>	19
4.2.3	<i>Late Iron Age (c. 1500 CE to 1850 CE)</i>	20
4.2.4	<i>Historical Layering</i>	21
4.2.5	<i>Impact Assessment Reports</i>	25
4.3	Heritage Screening Assessment Results	27
5	SOURCES OF RISK	29
6	DISCUSSION OF FINDINGS	29
7	RECOMMENDATIONS	30
8	REFERENCES	31

LIST OF FIGURES

Figure 4-1: Regional location of the Sigma Colliery ash backfilling project.	15
Figure 4-2: Jeppe's 1889 Map of the Transvaal. The red lines indicate the proposed Sigma Colliery project. Note the coal mines to the northeast of the project area.	22
Figure 4-3: Jeppe's 1889 Map of the Transvaal that shows significant more detail than the earlier 1889 map. Note the railway line to the east and south of the project area.	22
Figure 4-4: 1 st Edition Kroonstad (1900) Imperial Map. Note the expanded road networks.	23
Figure 4-5: Surveyor General Vereeniging 1: 125 000 (miles) 1928 map.	23
Figure 4-6: 2627D Vereeniging 1: 100 000 topographical map, 1950. The red circle indicates the Sigma Colliery project area. Note the shift in industry from Viljoensdrift to Vereeniging.	24
Figure 4-7: Historical 1973 aerial imagery of the Sigma Colliery project area. Note extensive development to the east of the project area (north is to the right of the image).	25
Figure 4-8: Typical natural landscape in Sigma Colliery project area.	27
Figure 4-9: Open cast pit area and tailings.	27
Figure 4-10: Rehabilitated area between fence and tailings.	27
Figure 4-11: One two buildings in the project area. The pipeline will be placed in the servitude (cf. Figure 4-12).	27
Figure 4-12: Example of pipe line route on old mine road.	28
Figure 4-13: General view of existing ash pipeline.	28
Figure 4-14: Detail of existing ash pipeline. Note the low impact on the landscape.	28
Figure 4-15: Example of a booster pump station located on the existing pipeline route.	28
Figure 4-16: Detail of area where subsidence has occurred.	28
Figure 4-17: Example of proposed pipeline route following farm boundary fence.	28

LIST OF TABLES

Table 2-1: Client contact details.	3
Table 2-2: Consultant contact details.	4
Table 2-3: Land owner contact details.	5
Table 2-4: Summary of statutory requirements applicable the to the Sigma Colliery heritage study.	9
Table 2-5: Activities to be authorised that trigger HIAs according to the NHRA.	10
Table 2-6: Listed triggers according to the NHRA.	11

Table 4-1: Location details for the Sigma Colliery ash backfilling project.....	13
Table 4-2: KPAs with specific reference / relevance to heritage resources management (adapted from 2013/2014 FZ-IDP)	17
Table 4-3: Possible ceramic traditions in the Sigma Colliery project area (adapted from Huffman 2007)	21

LIST OF APPENDICES

Appendix A: Curriculum Vitae of Specialists

Appendix B: Location and Site Maps

Appendix C: Site List of Identified Heritage Resources in the Project and Study Areas

Appendix D: Chance Find Procedures

LIST OF PLANS

Plan 1: Regional setting of the project and study areas 1:250 000

Plan 2: Regional setting of the project area 1:50 000

Plan 3: Regional setting of the project area 1:10 000

Plan 4: Geological setting of the project area 1:350 000

Plan 5: Identified heritage resources in the project and study areas 1:50 000

1 INTRODUCTION

Sasol Mining (Pty) Ltd (Sasol) proposes to undertake a project which involves the backfilling of old underground voids in the northern defunct area at the Sigma Colliery with ash. This is intended to mitigate risk associated with subsidence of the surface caused by historical underground mining activity at Sigma. The ash backfilling process will utilise several pipelines located above ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station to the underground voids. The return water pipelines will be used to abstract water from the mine voids to create space for backfilling. In order to commence with the project, Sasol has requested Digby Wells Environmental (Digby Wells) to assist in the application for an integrated Environmental Authorisation, inclusive of a heritage assessment.

In order to comply with Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) a Heritage Statement Report (HSR) in support of a Notification of Intent to Develop (NID) was compiled detailing the current cultural landscape and possible sources of risk to cultural heritage resources.

2 BACKGROUND INFORMATION OF PROJECT

Sasol's Sigma Colliery commenced operations in 1952 and holds mineral rights to coal deposits in the Sasolburg district. Underground mining was the primary method of extracting these reserves including board-and-pillar, rib pillar, long wall and high extraction methods. Access to the underground operations was via several shafts, and then conveyed to a 'dry' coal handling plant at 3 Shaft where the coal was screened and fed to silos. In 1992, the Wonderwater and Mohlolo strip mines were developed to extract coal from the north-eastern side of the reserves and the underground mining was scaled down and ceased by 1999.

As a result of the underground mining activity, subsidence of the surface was identified as a major risk. An Assessment Report on Surface Areas of Old Sigma Workings (Potential Failure Report) was compiled in 2012 and analysed the probability of incidents occurring on the properties overlaying the defunct Sigma Colliery workings, their current mitigation measures, the proposed next steps and immediate actions required. This Report informed that some properties / areas, such as the Parys road (R59), are rated as having a very high risk potential due to incidences which can lead to possible fatalities. Sigma Colliery backfilled mine workings located beneath the Sasolburg-Parys Road, the Sewage Works and certain privately owned farms to minimise the safety risk in the area.

The risk potential that exists as a result of the voids is due to the fact that mining took place over three time periods. The first period was prior to the implementation of safety factors in underground coal mining. During this period the pillars that were left behind were not adequately sized to support the mines roof, resulting in eventual collapse and subsidence of the surface (with reference to the Coalbrook disaster). During the second phase of mining, safety factors were applied, however, they were based on research done in the Witbank coalfield (Salomon and Munro). The safety factors applied with this methodology resulted in

pillars that were still inadequately sized. Although they provided an increase in safety, they would still collapse eventually. The safety factors were then amended and the calculation based on data from the Sasolburg coalfields, which resulted in more accurate factors of safety, which are still being used today.

2.1 Project Description

The proposed project is aimed at backfilling additional high risk mine voids with ash from Infrachem. The project will be undertaken in order to stabilise old underground mine workings which are considered to have a high potential risk for land subsidence, as determined in the Assessment on Surface Areas of Old Sigma Workings report. The project will also ensure that South Africa does not lose the agricultural land over which the voids are located. Should the project not go ahead, Infrachem will have to build another surface fine ash dam to manage the ash. These facilities have several environmental and health impacts associated with them which are not problematic with underground ash disposal. These include additional surface water contamination that must be managed; ash dust during windy periods; health impacts associated with ash dust; visual impacts; it will require long term management; and it will not have any of the benefits of stabilising the surface for agriculture thereby sterilising additional land.

The ash backfilling process will use several pipelines located above-ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station at Infrachem, to the mined out voids. Return water pipelines (the main one already in place) will be used to dewater the voids before backfilling starts to prevent decant as a result of hydrostatic pressure. The water that will be pumped out will be sent for treatment at a planned Sasol Group water treatment plant (authorisation for this plant is not part of this project). Infrachem have approximately 10 million cubic meters (Mm³) of ash to use for backfilling and stabilising the surface.

The pipelines transporting slurry will run aboveground on Sasol owned property and within existing servitudes where possible. Where this is not possible, existing culverts and crossings will be used; alternatively new agreements will be entered into with land owners. The pipeline route will be specifically selected to ensure that the pipes run along existing servitudes, linear infrastructure and disturbed areas to minimise the impact on the receiving environment.

2.2 Current Project Status

Sigma Colliery has applied for the following authorisations required for identified listed activities relevant to the backfilling project and the construction and operation of the proposed infrastructure

- An integrated Environmental Authorisation through a Basic Assessment in terms of the National Environmental Management Act, (Act No. 107 of 1998) (NEMA);
- A waste licence through a Social and Environmental Impact Assessment (S&EIA) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA); and
- An integrated Water Use Licence Application (IWULA) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

A list of activities for which authorisation has been applied for under NEMA are provided in Table 2-5. The list also correlates with Section 38(1) of the NHRA where certain types of development / activities trigger heritage assessments.

2.3 Relevant Contact Details

The contact details of the developer, consultant and landowners are provided in Table 2-1, Table 2-2 and Table 2-3 respectively.

Table 2-1: Client contact details

ITEM	COMPANY CONTACT DETAILS
Company	Sasol Mining (Pty) Ltd, Sigma Colliery
Contact person	Chris Scheppel
Tel no	016 970 6476
Fax no	011 522 5963
Cell no	082 490 0310
E-mail address	chris.scheppel@sasol.com

Table 2-2: Consultant contact details

ITEM	COMPANY CONTACT DETAILS
Company	Digby Wells Environmental
Contact person	Marcelle Radyn
Tel no	011 789 9495
Fax no	011 789 9498
Cell no	082 244 1405
E-mail address	marcelle.radyn@digbywells.com
Postal address	Private Bag X10046, Randburg, 2125, South Africa

Table 2-3: Land owner contact details

Farm name	Portion	Owner	Contact number	Postal / Email Address
Alfresco No. 202	1, R	Interferon Trust Kerneels Rossouw	082 557 6561	Po Box 585, Sasolburg, 1947
Alicedale No. 301	1, R	F. W. Strydom	082 805 6985	Po Box 710, Sasolburg, 1947
Beginsel No. 310	R	Lucas Erasmus	083 628 8097	Po Box 1680, Sasolburg, 1947
Boschbank No.12	2	Sasol Mining (Pty) Ltd - A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
	3	C. A. Jordaan	056 333 8834 / 083 299 6672	-
	R	A. M. Rossouw Eiendomme (Pty) Ltd	082 557 6561	Po Box 585, Sasolburg, 1947
Brakkuil No. 401	R	Brakkuil Trust Dirk Strydom	082 805 6985	Po Box 710, Sasolburg, 1947
Clifton No. 316	R	D. J. Strydom Trust	082 805 6985	Po Box 710, Sasolburg, 1947
Die Pan No. 225	R	Tharina No. 2 Trust Tharina	082 451 1515	Po Box 6323, Vaalpark, 1948
Donkerhoek No. 323	R	Lewies Trust	082 322 4312	lewis100@gmail.com
Gouverneur's Kraal No. 333	R	Beginsel Boerdery Trust Lukas Erasmus	016 976 9142 / 083 628 8097	Po Box 1680, Sasolburg, 1947

Farm name	Portion	Owner	Contact number	Postal / Email Address
Herewarde No. 409	R	Sasol Townships (Pty) Ltd - Johan Van Rooyen	017 610 2090 / 082 554 7193	Private Bag X1000, Secunda, 2302
	6	Sasol Chemical Industries (Pty) Ltd - A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Kruidfontein No. 67	5	L. P. J. Besigheidsdienste - L. P. J. Barnard	016 973 2689 / 016 454 0154	Po Box 1367, Sasolburg, 1947
	6, 7	J. F. Weilbach	-	-
Uitkomst No. 413	R	Sasol Mining (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Weltevreden No. 182	R	Beginsel Boerdery Trust Lukas Erasmus	016 976 9142 / 083 628 8097	Po Box 1680, Sasolburg, 1947
Zaaipplaats No. 203	R	Brakkuil Trust Dirk Strydom	082 805 6985	Po Box 710, Sasolburg, 1947
Zwanenberg No. 450	1	R. J. Knoetze	082 745 7218	Po Box 1602, Sasolburg, 1947
	2	M. C. Knoetze	016 976 1404 / 082 323 7894	Po Box 1499, Sasolburg, 1947
Roseberry Plain No. 250	R	Knoetze Family Trust	082 745 7218	Po Box 1602, Sasolburg, 1947
	1, 7	Sasol Chemical Industries (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
	5	Metsimaholo Local Municipality - Gerrit Steenkamp	016 973 8406	Po Box 60, Sasolburg, 1947 Gerhards@Lantic.Net

Farm name	Portion	Owner	Contact number	Postal / Email Address
Donkerhoek No. 323	1	Sasol Chemical Industries (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Herewarde No. 409	8	Sasol Chemical Industries (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
The Star No. 387	1	Sasol Townships (Pty) Ltd - Johan Van Rooyen	017 610 2090 / 082 554 7193	Private Bag X1000, Secunda, 2302
	R	Alfresco Trust Kerneels Rossouw	082 557 6561	Po Box 585, Sasolburg, 1947
Donkerhoek No. 323	R	Lewies Trust	082 322 4312	lewis100@gmail.com
Kruidfontein No. 67	R	Prontuitbeleggings 11 (Pty) Ltd Cap Weilbach	016 976 8123 / 082 387 5878	Po Box 2257, Sasolburg, 1947
Uitkomst No. 413	R	Sasol Mining (Pty) Ltd - A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Tweelingfontein No. 386	R	Beginzel Boerdery Trust Lukas Erasmus	016 976 9142 / 083 628 8097	Po Box 1680, Sasolburg, 1947
Mullersrust No. 352	17, 18	Sasol Mining (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Boschbank No. 12	5	Jan Rossouw Trust	082 557 6561	-
Bersheba No. 1	4	George Atkinson Trust	-	-
Goedehoop No. 272	2	A. H. S. Beleggings Pty Ltd	-	-

Farm name	Portion	Owner	Contact number	Postal / Email Address
Londondale No. 442	8, R	Sasol Mining (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Wonderfontein No. 350	21	M. E. Je De Jager	012 327 6381 082 758 5438	Po Box 14056, Sinoville, 0129
	20	Wonderwater Familie Trust	-	-
	23, 24	Sasol Mining (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Wonderwater No. 180	3, 9, 10, R	Sasol Mining (Pty) Ltd – A. S. Potgieter	017 614 8000	Po Box 699, Trichardt, 2300
Saltberry Plain No. 422	R, 1	-	-	-
Saltberry Plain No. 137	R, 1	-	-	-
Gysbert No. 1161	2	-	-	-
Gysbertshoek No. 315	R 2	-	-	-

2.4 Statutory Requirements

The legislative framework – with specific reference to heritage resources management – within which the project is undertaken and complies with is summarised in Table 2-4.

Table 2-4: Summary of statutory requirements applicable the to the Sigma Colliery heritage study

Legal framework	Application
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	Section 2(4)a(iii) requires that the South Africa's cultural heritage must be protected and conserved, and where this is not possible, impacts are minimised and remedied
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	Section 38 provides the framework within heritage resources management must be undertaken.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	Section 48(b) and (c)(ii) requires the licencing authority to take into account the effect pollution may have on cultural heritage and to ensure best practicable options to protect cultural heritage from harm.

2.4.1 National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)

Section 38(8) - The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (*replaced by NEMA*), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act No. 50 of 1991) (*replaced by the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)*), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

The table below lists the activities that trigger a Heritage Impact Assessment (HIA) in accordance with the NHRA.

Table 2-5: Activities to be authorised that trigger HIAs according to the NHRA

Notice no.	Activity no.	Description of listed activity ¹	NHRA trigger
544, 18 June 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	38(1)(a)
		Sasol aims to construct a number of pipelines from the ash pump station to the various voids (for the transportation of ash slurry). These pipelines will be of various diameters, however the larger ones will have an internal diameter of approximately 0.36 m.	
	11 (iii) and (vi)	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	38(1)(b)
		Sasol aims to construct a number of pipelines from the plant to the various voids (for the transportation of ash slurry). These pipelines will occur within 32 metres of some unnamed streams and wetlands.	

¹ Descriptions are provided as per the detailed project description and not as per wording of the relevant Government Notice.

Table 2-6: Listed triggers according to the NHRA

NHRA (1999) trigger	Description
Basic Assessment, scoping and full EIA	
38(1)(a)	Construction of a road longer than 300 m
38(1)(c)(i)	Transformation of land in excess of 5 ha that will change the character of a site
38(1)(d)	Rezoning of land in excess of 10 ha
38(1)(c)(ii)	Transformation of land involving three or more existing erven or divisions

2.5 Scope of Work

In order to comply with the above, a Heritage Statement Report (HSR) was compiled that should inform the Notification of Intent to Develop (NID). The HSR included sufficient information regarding existing and potential heritage resources that may occur in the project location. The nature and extent of the development was also described in sufficient detail to enable the Heritage Resources Authority (HRA) to determine whether an impact assessment is required. If an impact assessment is required, the HSR should thus be considered the actual first phase of the HIA Phase.

The NID and HSR have therefore included the following activities:

- Project background;
- Details of properties on which the proposed Sigma Colliery project will take place, including regional and site maps, footprints of proposed infrastructure;
- Landowner contact details and permission;
- Details of known and / or potential heritage resources located in the vicinity of the proposed project area identified through:
 - Archival and database searches to determine relevant historical information of the project area;
 - Desktop GIS-based cartographic surveys to determine historical land use and to identify potential heritage resources that may be visible on maps, aerial and satellite imagery;
 - Review and collation of information contained in available heritage assessments that can contribute to understanding and defining the cultural landscape;

- Screening of the proposed project area through brief physical surveys to establish whether actual heritage resources are located in the project area, as well as to evaluate the potential for heritage resources to occur;
- Predict and list potential or envisaged impacts on heritage resources;
- Preliminary Statement of Significance of existing or potential heritage resources; and
- Specialist motivation whether or not an HIA is required.

3 METHODOLOGY

3.1 Literature Review

Relevant and available published works such as academic journals, academic books, unpublished theses and reports, previous palaeontological and heritage assessments, and websites were reviewed.

3.2 Historical Layering

A review of historical maps and aerial imagery was completed. Aerial imagery was overlaid to assess the changes in the receiving environment over time. Additionally, published geological maps were also assessed.

3.3 Heritage Screening Assessment

A screening site visit was completed on 25 September 2013. A representative of Sigma Colliery accompanied Johan Nel from Digby Wells. During the site visit all the proposed pipeline routes and ash backfilling areas were visited.

3.4 Summary of Public Participation

Public participation is an essential and legislative requirement for environmental authorisation in a number of the major Acts applicable to the proposed Sigma Colliery ash backfilling project. The principles that demand communication with society at large are best embodied in the principles of the NEMA.

The objectives of the public participation are to ensure that all stakeholders and Interested and Affected Parties (I&APs) are given accurate and timeous project information, and are given an opportunity to raise comments and concerns.

4 STATE OF THE RECEIVING ENVIRONMENT/CULTURAL LANDSCAPE

4.1 General Description of Affected Environment

The ash backfilling project falls under the jurisdiction of the Metsimaholo Local Municipality (MLM) is situated in the Fezile Dabi District Municipality (FDDM) in Free State and its towns are Sasolburg, Deneyville, Oranjeville and Viljoensdrift. Detailed location data are provided in Table 4-1 below and depicted in Figure 4-1.

Table 4-1: Location details for the Sigma Colliery ash backfilling project

Province	Free State
Magisterial district	Sasolburg
District municipality	Fezile Dabi District Municipality
Local municipality	Metsimaholo Local Municipality
Nearest town	Sasolburg
1: 50 000 topographic map sheets	2627DA, DB, DC & DD
Relative centre coordinates of site / project area	26.811244° S 27.789468° E
Recording method	Google Earth

The predominant land use is agricultural – maize cultivation and cattle grazing – and industrial (Fezile Dabi District Municipality, 2013). The landscape has undergone significant changes since the late 19th century as indicated by a survey of historical cartographic sources described under Section 4.2.4 below.

All location and site maps are presented in Appendix B.

4.1.1 Vegetation

The general landscape is characterised by grasslands. Greffrath (2013) describes the natural environment as belonging to the Grassland Biome that is mainly found on South Africa's high central plateau, as well as the KwaZulu Natal and Eastern Cape interior. Although the topography of the project area is predominantly flat and undulating it includes the Highveld escarpment. A single layer of grasses is typical of this biome type, but the extent of cover is dependent on rainfall and the degree of grazing. The Sigma Colliery project area comprises two bioregions (Mucina & Rutherford, 2006). The Central Free State Grassland (Gh 6) of the Dry Highveld Grassland Bioregion occurs in an arc east of Sasolburg, terminated by the Vaal River in its northern extent and extending well into the central Free State (*ibid*). Immediately west of Sasolburg extending northwards across the Vaal River is the Soweto Highveld Grassland (Gm 8) of the Mesic Highveld Grassland Bioregion (*ibid*).

The Central Free State Grassland is characterised by short grassland with *Themeda triandra* dominating natural areas. Degraded landscapes are however dominated by *Eragrostis curvula* and *E. chloromelas* (Mucina & Rutherford, 2006). *Acacia karroo* encroach overgrazed areas in low-lying, heavy clayey soils (*ibid*). As a natural heritage resource, this bioregion is considered vulnerable as nearly 25% of the bioregion area has been transformed through large dam construction and crop cultivation (*ibid*. 382).

The Soweto Highveld Grassland in turn supports short to medium-high, dense, tufted grassland. As with the former type, this grassland is nearly completely dominated by *T. triandra*, although accompanied by a wider variety of other grasses (Mucina & Rutherford, 2006). The conservation status of Soweto Highveld Grassland is considered endangered as nearly 50% of the area that would be naturally covered by it has been transformed by urbanisation, mining, cultivation and road infrastructure (*ibid*).

These grasslands are maintained largely by the combination of natural and anthropogenic factors including high extremes in maximum summer and minimum winter temperatures, relatively high summer rainfall, fires, frost and grazing (Greffrath, 2013; Mucina & Rutherford, 2006) which preclude the presence of shrubs and trees.

Greffrath (2013) states that much of the grassland biome has been transformed by crop farming, afforestation, and dense human settlement. This is confirmed in Section 4.2.4 below. Sour grassland occurs in the high rainfall eastern grassland regions (average rainfall >625 mm / annum), on relatively acidic (leached) soils, and is characterized by being short and dense in structure, having a high fibre content and a tendency to withdraw its nutrients from its leaves to its roots during the winter, rendering it largely unpalatable to stock during this time. Sweet grassland is found in the relatively low rainfall western areas, is tall but fairly sparse in structure, has low fibre content and retains nutrients in its leaves during the winter. Mixed grassland represents a transition or combination of sour and sweet grassland types (Roberts, 2012).

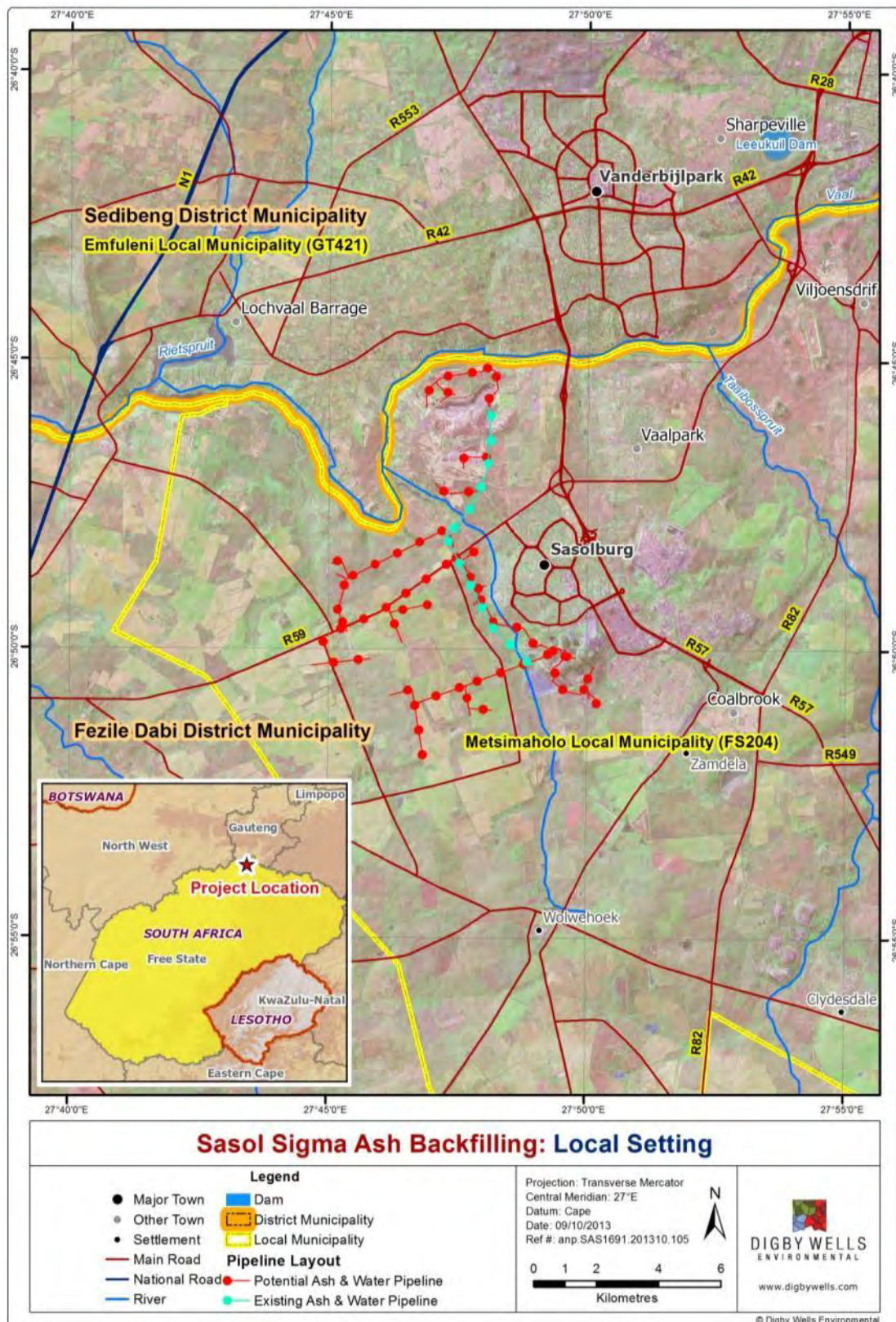


Figure 4-1: Regional location of the Sigma Colliery ash backfilling project.

4.1.2 Rezoning and / or Land Subdivision

No rezoning and / or land subdivision will be required to implement and complete the proposed Sigma Colliery project.

4.1.3 Development Context of Study Area

The 2013 / 2014 Fezile Dabi Integrated Development Plan (FD-IDP) states that the FDDM primary industry and land use is agriculture. However, the FDDM is the only local municipality where the private manufacturing sector that is dominated by Sasol (Fezile Dabi District Municipality, 2013). In terms of heritage, the FD-IDP makes reference to the 'Riemland route', a self-drive tourism route that includes heritage sites such the Vechkop Battlefield, the Riemland Museum (a synagogue) and the Vredefort Dome World Heritage Site. Heritage in its broadest sense is furthermore included in the FD-IDP goals or Key Performance Areas (KPAs) as indicated in Table 4-2.

In general however, the FZ-IDP focusses on service delivery and developing industries to facilitate such delivery. The result is that tangible heritage that exists in the FDDM is at risk with the potential increase in infrastructure development projects.

Table 4-2: KPAs with specific reference / relevance to heritage resources management (adapted from 2013/2014 FZ-IDP)

IDP Goal / objective	Strategies	Key Performance Outcome	Key Performance Indicator	Specific project / programme	Relevance to heritage resources management
KPA 3		Local economic development			
Community development					
Promoting community development programs	Arts and crafts development in communities	Capacitated/ skilled Artists and Crafters	Number of Artists and Crafters assisted	Provision of training; equipment; production and exposure to markets for performing and visual arts	Living heritage – traditional crafts, oral traditions, IKS
Sustaining Arts and Culture	Supporting municipal theatres	Ensuring theatres are functional and active	Annual funding allocation	Municipal Theatre Support	Living heritage – performances, oral history
	Develop and implement programmes to assist amateurs to reach professional level	Professional performing artists	Number of enrolled local performing artists in academic institutions	Empowerment of local artists	
	Regional Performing Arts development	Developed and resourced performing artists	Number of groups to be assisted	Financial assistance to identified performing groups	
Tourism					
Establish tourism market	Annual Tourism and Heritage Awareness Campaign	Tourism conscious communities	Mobilization of communities; Presentations at schools to encourage tourism as a subject	Tourism Month celebration	Intangible heritage – sense of place, Living heritage – arts; Tangible heritage – sites; and Presentation of heritage.

IDP Goal / objective	Strategies	Key Performance Outcome	Key Performance Indicator	Specific project / programme	Relevance to heritage resources management
KPA 5		Good governance and public participation			
Celebrating historical heritage, commemorate Maokeng day; and Tumahole day.	Forming task teams with concerned local municipalities to plan and implement intended programmes	Create awareness about historic days regarding democracy and success hosting of the event within certain communities	Number of people in attendance	Hosting of commemorative days	Liberation heritage Tangible – sites Intangible - associations
Celebrate general historical heritage	Form a task team with Officials from all local municipalities	Implement awareness campaign	Better understanding of our heritage and our rich history	Proudly South African campaign	General, integrated heritage management

4.2 Literature Review

4.2.1 Geological Character and Palaeontological Potential

The project area is situated in the Sasolburg-Vereeniging Coal Field which forms part of the Karoo Basin. The Karoo Basin is divided into the Dwyka, Ecca and Beaufort Groups. The geology of the area is illustrated in Plan 4. It is evident from this that the area is underlain primarily by sedimentary lithologies of the Ecca Group of the Karoo Supergroup, in particular those associated with the Vryheid Formation.

The composition of the sediments includes shale (often carbonaceous), mudstone, siltstone, sandstone and the economically important coal seams mined by the Sigma Colliery. The sedimentary rocks are invaded by post-Karoo (younger) dolerite intrusions mainly in the form of sheets (sills). The sediments are underlain by the Dwyka Group tillite (diamictite) which represents the basal unit of the Karoo Supergroup. The diamictite, in turn, overlies the basal rocks represented either by dolomite of the Malmani Subgroup of the Chuniespoort Group or lava of the Ventersdorp Supergroup (van Tonder, 1997).

The Vryheid Formation consists of sandstone, shale, mudstone and coal. The rocks of the Vryheid formation of the Ecca Group are renowned for their wealth of plant fossils of the famous Gondwanan *Glossopteris* flora which has been described from the Permian aged-rocks (Rubidge, 2008). This flora is the source of the coal which is mined from the Vryheid Formation in South Africa.

Important plant fossil localities have previously been found in areas close to Vereeniging. Seward (1903), for example, described impression fossils of the plant *Bothrodendron leslii*. Similarly, Rayner (1985) also described lycopods such as *Cyclodendron leslii* found close to Vereeniging.

4.2.2 Early to Later Stone Age (c. 2.5 mya to 1st millennium CE)

Evidence of all three phases of the Stone Age – Early, Middle and Late – are found in the Free State Province. The majority of the Stone Age recorded sites from previous studies were limited to scatters of stone tools associated with the Middle Stone Age (MSA) (250 000 to 20 000 years ago (CE)) and Later Stone Age (LSA). The MSA period can be defined by the occurrence of blades and points produced from good quality raw material. Bone tools, shell beads and pendants, as well as the use of ochre are also present. The LSA is dated to approximately 20 000 BP onwards and can be characterised by the presence of microlithic technology and strong signs of ritual practises and complex societies, as well as rock art. Microlithics are produced from very fine-grained material such as quartz or chert, and often used as composite tools where they are hafted onto sticks for arrows (Deacon & Deacon, 1999).

4.2.3 Late Iron Age (c. 1500 CE to 1850 CE)

The consensus among archaeologists is that the central regions of South Africa – specifically the southern Highveld – have only been settled by Iron Age agricultural groups relatively late when compared to the northern and eastern parts of the country (Chirikure, et al., 2008; Maggs, 1976). The southern Highveld is, historically, a relatively inhospitable environment for early farmers to have exploited. As referred to in Section 4.1 above, the area is generally devoid of trees, subject to sour grass in winter and experiences extreme differences in temperature. This would have impacted on early farming communities as they were generally dependant on firewood for domestic activities and metalworking, in addition to using wooden poles in constructing houses and fences.

From around the 15th century CE however, Iron Age farming communities start appearing on the landscape, initially associated with Sotho-speakers, but more recently also possible with Nguni-speakers (Chirikure, et al., 2008; Huffman, 2007; Maggs, 1976).

The most visible evidence of the 15th century farmer groups in the general region within which the Sigma Colliery project is located are various stonewalled settlement types. The most common of these Maggs (1976) has termed ‘Type V’ settlements. These settlements occur in the north-eastern part of the Free State into southern Mpumalanga as far as Bethal and Ermelo. They were first described by Van Riet Lowe in 1927 at Vegkop. Based on Maggs’ aerial surveys, it is evident that Type V settlements ‘cluster around main river systems’ such as the upper Vaal River. However, based on Maggs’ 1974 settlement distribution map (Maggs, 1976, pp. 38 - 39), no Type V sites have been recorded in the project area, but two ‘Vredefort Dome/Type Z’ sites are nearby.

The stonewalling evident at these sites would have been cattle and other stock enclosures surrounded by thatch beehive huts (Huffman, 2007, p. 33). There is some evidence that corbelled stone huts may have evolved from the thatch beehive design (*ibid.*; Walton 1951).

Material culture that are most often associated with Iron Age sites are ceramics. Ceramic stylistic analysis – form and decorative motif – provide a guideline whereby sites can be placed within a relative temporal and cultural context. Tom Huffman has collated findings from diverse sites and dates throughout southern Africa that culminated in his comprehensive publication (Huffman, 2007). Based on his analysis the ceramic facies that may occur in the Sigma Colliery project area are listed in Table 4-3 below.

Table 4-3: Possible ceramic traditions in the Sigma Colliery project area (adapted from Huffman 2007)

Facies	Likely date range	Associated settlement type
Ntsuanatsatsi	1450 to 1650	Type N
Uitkomst	1650 to 1820	Klipriviersberg
Makgwareng	1700 to 1820	Type V
Olifantspoort	1500 to 1700	N/A
Thabeng	1700 to 1840	Type Z
Buispoort	1700 to 1840	N/A

4.2.4 Historical Layering

The Jeppe's Map of the Transvaal (1889) depicted in Figure 4-2, indicated several coal mines to the northeast of the Sigma Colliery project area near Vanderbijlpark and Vereeniging. This map however lacks detail, possibly indicating relative sparse human settlement. This is evident when compared to Jeppe's 1899 map illustrated in Figure 4-3. Of interest is that a mere ten years later, a railway line is indicated to the east and south of the Sigma Colliery project area, reflecting an increase in human settlement and industrial activity.

The first edition of the Kroonstad Imperial Map (1900) depicted in Figure 4-4 illustrates a significant expansion of road networks when compared to the 1899 Jeppe's map. By 1928, Viljoensdrift, indicated in the Surveyor General Vereeniging map in Figure 4-5, was a relatively important node. The importance of the little town is notable based on several features evident on the map such as a post office, court house, railway station and siding and the Cornelia Coal Mine.

By 1950, farm subdivisions seem to have remained constant as seen in Figure 4-6. However, there is also a shift evident with regard to Viljoensdrift. This town is significantly smaller than in the 1928 Jeppe's map, with most industry seemingly focussed in Vereeniging.

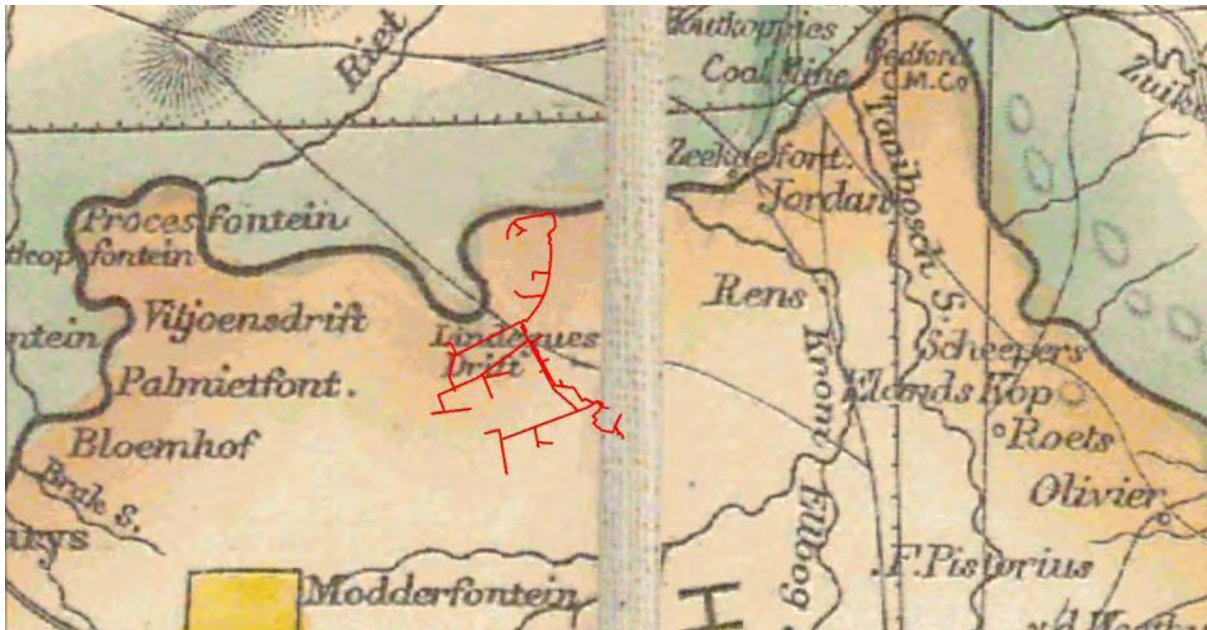


Figure 4-2: Jeppe's 1889 Map of the Transvaal. The red lines indicate the proposed Sigma Colliery project. Note the coal mines to the northeast of the project area.

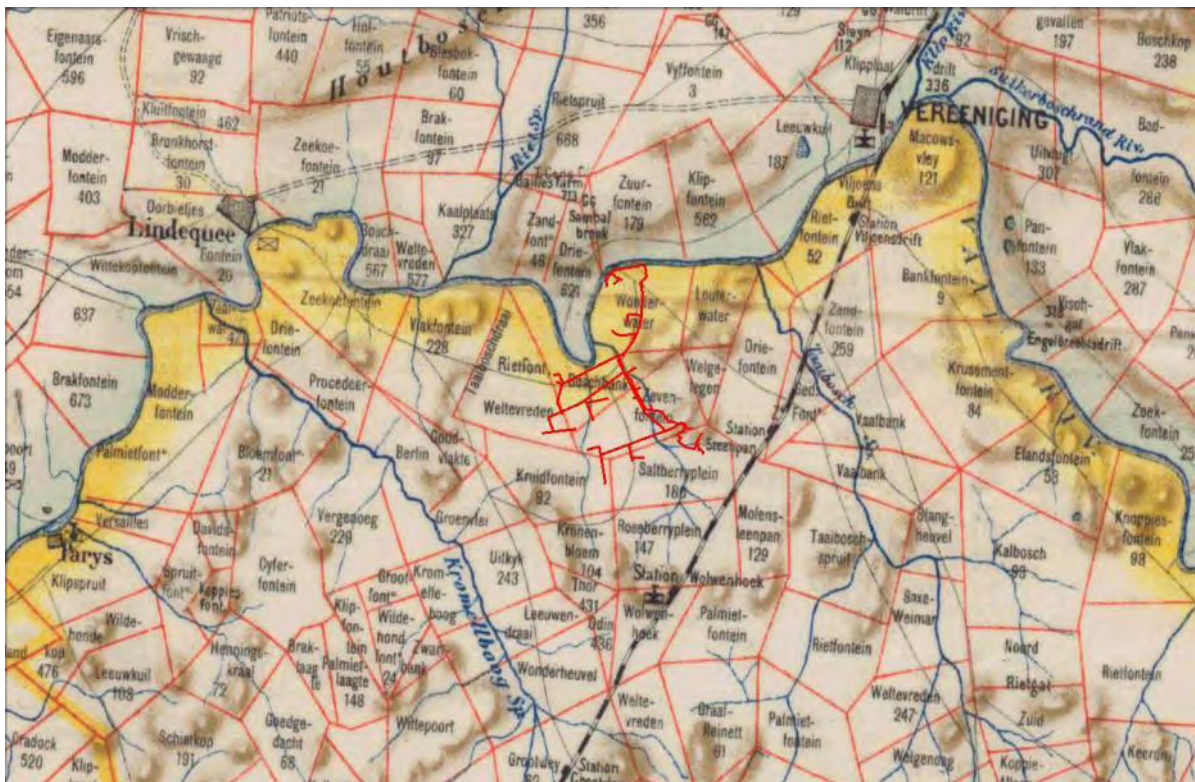


Figure 4-3: Jeppe's 1889 Map of the Transvaal that shows significant more detail than the earlier 1889 map. Note the railway line to the east and south of the project area.



Figure 4-4: 1st Edition Kroonstad (1900) Imperial Map. Note the expanded road networks.

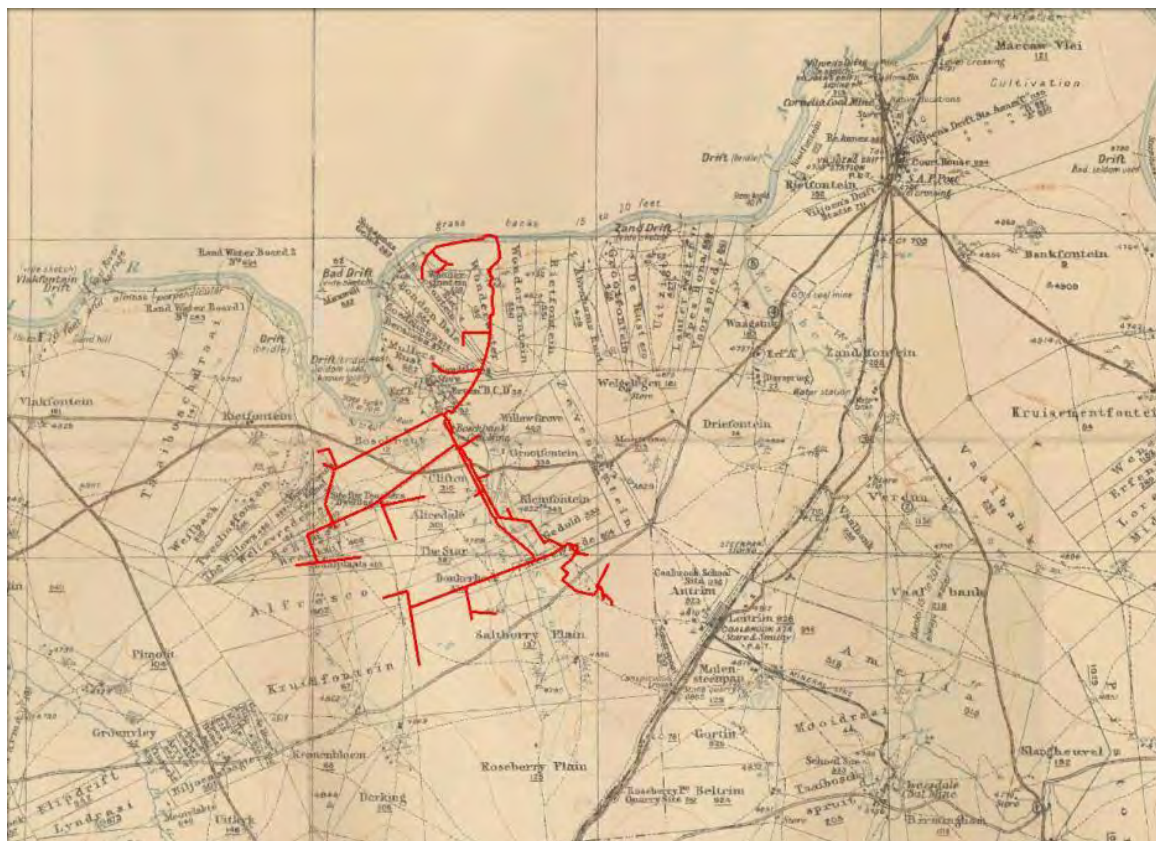


Figure 4-5: Surveyor General Vereeniging 1: 125 000 (miles) 1928 map.



Figure 4-6: 2627D Vereeniging 1: 100 000 topographical map, 1950. The red circle indicates the Sigma Colliery project area. Note the shift in industry from Viljoensdrift to Vereeniging.



Figure 4-7: Historical 1973 aerial imagery of the Sigma Colliery project area. Note extensive development to the east of the project area (north is to the right of the image).

4.2.5 Impact Assessment Reports

A total of 13 impact assessment reports were reviewed in relation to the Sigma Colliery project area. The findings identified a wide range of tangible heritage resources within the general region. However, there is common agreement by the authors of these reports that the identified heritage resources are overall of low significance. The exceptions are burial grounds and an engraving site.

MSA, LSA and Late Iron Age sites, and historical burial grounds and structures were identified on the farms Rivierplaats No. 404, Rietfontein No. 123, Uitkomst No. 413, Petronella No. 313 and Boschbank No. 12 (Van Schalkwyk & Naude, 1996). The Stone Age finds included MSA scatters on the surface and one identified LSA site. The Iron Age sites comprised two stonewalled settlements possibly affined the Vredefort Dome / Type Z settlements described by Maggs (1976).

At least one rock art site – the Leeuwkuil engraving site – is known to exist near Vereeniging. This site has been discussed by Hollman (1999). The site comprises at least 24 engravings of mainly eland and other antelope and one rhinoceros. Leeuwkuil is situated on a small island in the Vaal River north of the Ascot Bridge.

The farms Grootfontein No. 425, De Rust No. 370 (Dreyer, 2005a) and Amelia No. 518 (Dreyer, 2005b) were surveyed. Results from these surveys only identified historical heritage resources including burial grounds, a memorial and stone foundations of a historical structure. Another 2005 survey and report near Vereeniging (Van der Walt & Birkholtz,

2005) noted that the project area was a focal point for historic mining activity (cf. 4.2.4 above). The survey showed that historic structures have been demolished and only remnants remained. In addition, three burial grounds were also identified and ruins of historic structures including traces of an old mine shaft, rubbish dump and water tower. Foundations and middens associated with mine workers' housing were also noted.

The farm Lucina No. 214 was surveyed during which only demolished structures and a large burial ground were identified (Van Schalkwyk, 2006).

A survey of the Remainder of the farm Mooidraai No. 44 (Van Ryneveld, 2007) identified five heritage resources, but four of these were termed 'contemporary' and therefore excluded from the assessment. The only site identified that would have been protected under Section 34 of the NHRA was an historical structure. This site constituted the foundations of an original farm homestead.

Two heritage resources were identified on the farm Leitrim No. 926 (Birkholtz & James, 2008). These included an original farm *werf* that was already established by 1940 and an associated burial ground. During a survey of subdivisions 6 and 10 the farm Erina No. 121 (Van der Walt, 2008a; Van der Walt, 2008b) no heritage resources were noted.

Two reports on an extensive linear survey from Secunda to Sasolburg were reviewed. The first, a palaeontological report (Rubidge, 2008), indicated that no fossils are known for the Ventersdorp and Transvaal Supergroups due to the antiquity of the rock. Although, *Glossopteris* is known to occur in the Vryheid group with important localities near Vereeniging, the thick soil layers covering this rock reduces any potential finds. The second report (Pistorius, 2008) identified several historical sites and burial grounds along the route, but no evidence for Stone Age or Iron Age.

A large burial ground was identified as the only heritage site on a portion of the farm Boschbank No. 12 whilst no heritage was identified on Portion 3 of Wonderfontein 350 (Van der Walt, 2009).

A survey of Portion 9 of the farm Rietfontein (Van der Walt, 2011) also only identified a burial ground as a heritage site.

All identified sites are presented in Appendix C.

4.3 Heritage Screening Assessment Results

The heritage screening survey conducted on 25 September 2013 did not identify any tangible heritage resources that would be potential impacted on by the proposed Sigma Colliery ash backfilling project. Similarly, no outcrops of rock were noted where a likelihood of fossils could be expected.

The screening survey confirmed the descriptions of the environment and landscape under Section 4.1 and Section 4.2.4 above that the landscape has been subject to degradation due to agriculture, urbanisation, mining, industrialisation and expanding road infrastructure.

In addition, the screening survey confirmed that all proposed pipeline routes will be located either within existing servitudes or along farm boundary fences. The areas earmarked for ash backfilling and where boreholes will be drilled into the underground voids were also found to be primarily in cultivated lands or old mine workings.

Figure 4-8 to Figure 4-17 below depict the general landscape recorded during the screening survey.



Figure 4-8: Typical natural landscape in Sigma Colliery project area.



Figure 4-10: Rehabilitated area between fence and tailings.



Figure 4-9: Open cast pit area and tailings.



Figure 4-11: One two buildings in the project area. The pipeline will be placed in the servitude (cf. Figure 4-12).



Figure 4-12: Example of pipe line route on old mine road.



Figure 4-13: General view of existing ash pipeline.



Figure 4-14: Detail of existing ash pipeline. Note the low impact on the landscape.



Figure 4-15: Example of a booster pump station located on the existing pipeline route.



Figure 4-16: Detail of area where subsidence has occurred.



Figure 4-17: Example of proposed pipeline route following farm boundary fence.

5 SOURCES OF RISK

No sources of risk to heritage resources were identified in relation to the construction, operational and decommissioning phases of the Sigma Colliery ash backfilling project:

- The project proposes to either recommission or upgrade existing pipelines and install similar pipes where required. The construction of the pipelines will be low-impact as the pipes will be above ground. The main intrusive activity will be the construction of concrete plinths to support the pipeline where required;
- As most pipelines are within existing servitudes or along farm boundary lines, construction of access roads will not be required. Where access may be necessary it will merely entail bush or surface vegetation clearing in already disturbed areas;
- The construction methods are furthermore of such a nature that should any heritage resource (e.g. a burial ground) be encountered, the pipeline route may be deviated to avoid any direct impact on a site; and
- The proposed project is also not expected to impact or change the character of the landscape or sense of place. In fact, the risk of subsidence should be seen as a greater risk.

6 DISCUSSION OF FINDINGS

The current cultural landscape is primarily agriculture with large parts having been altered by industry, mining and town development. Agricultural activities would have, over the years, destroyed most archaeological resources that may have been present. Open cast mining and rehabilitation of sites would further have destroyed any viable archaeological sites and palaeontology that may have existed pre-1999 and before the NHRA came into effect. The entire area, underlain by the Vryheid Formation, which will be crossed by proposed pipelines required for the ash backfilling, is devoid of rock outcrops and is covered by either grassland or by ploughed fields. It is thus very unlikely that any fossil heritage will be damaged by activities relating to the ash backfilling.

In addition, urban sprawl along the Vaal River Barrage banks has significantly reduced the potential of identifying Stone Age sites there. No historical built environment resources, townscapes or burial grounds were noted during the screening assessment, but any impact to such resources by the proposed project would be negligible. The impact due to subsidence on these resources would be far greater.

A review of heritage reports relevant to the Sigma Colliery project area further indicated that typical heritage resources occurring in the region are historical structures and burial grounds with relatively low significance. There are exceptions such as the Leeuwkuil engraving site and Iron Age stonewalled settlements. However, none of the reviewed reports explicitly addressed intangible heritage, including landscape character and sense of place. This omission is contrasted by the FD-IDP that refers to the importance of heritage (with a bias

towards intangible and liberation heritage) in the district as beneficial to tourism and good governance.

7 RECOMMENDATIONS

Given the current state of the cultural landscape, the apparent absence of any significant tangible heritage resource and the limited impact of the proposed Sigma Colliery ash backfilling project, the following recommendations are made:

- The South African Heritage Resources Agency (SAHRA) and the Free State Provincial Heritage Resources Authority (FSPHRA) must consider granting Sigma Colliery exemption from a HIA inclusive of all complementary specialist studies, for the Sigma Colliery ash backfilling project;
- If granted the exemption should however be subject to periodic monitoring of the construction of the pipeline and ash backfilling activities to ensure that heritage resources are avoided if present;
- It must also explicitly be stated that if exemption is granted, it only applies to the Sigma Colliery project as described in this report – any additional work or deviations may be subject to additional heritage studies; and
- In the event that any heritage resources are accidentally found during the course of the project, work must cease and appropriate Chance Find Procedures (CFPs) must be implemented. The CFPs are presented in Appendix D.

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Appendix A: Curriculum Vitae of Specialists



JOHAN NEL

Mr Johan Nel

Unit manager: Heritage Resources Management

Social Sciences

Digby Wells Environmental

1 EDUCATION

2002 BA Honours - Archaeology

2001 BA Anthropology & Archaeology

1997 Matriculated Brandwag Hoërskool

2 LANGUAGE SKILLS

Fluent in English and Afrikaans

3 EMPLOYMENT

2011 to present Unit manager: Heritage Resources Management, Digby Wells Environmental

2010-2011 Archaeologist, Digby Wells Environmental

2005-2010 Manager and co-owner, Archaic Heritage Project Management

2003-2005 Freelance archaeologist

Resident archaeologist, Rock Art Mapping Project, Ndidima, Ukhahlamba-Drakensberg World Heritage Site

2002-2003 Special Assistant: Anthropology, Department of Anatomy, University of Pretoria

2001-2002 Technical Assistant: Department of Anatomy, University of Pretoria

1999-2001 Assistant: Mapungubwe Project, National Cultural History Museum & Department of Anthropology and Archaeology, UP

4 EXPERIENCE

I have 13 years of combined experience in the field of cultural heritage resources management (HRM) including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. I have gained experience both within urban settings and remote rural landscapes. Since 2010 I have been actively involved in environmental management that has allowed me to investigate and implement the integration of heritage resources management into environmental impact assessments (EIA). Many of the projects since have

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Directors: A Sing*, AR Wilke, LF Koeslag, PD Tanner (British)*, AJ Reynolds (Chairman) (British)*, J Leaver*, GE Trusler (C.E.O)

*Non-Executive

required compliance with International Finance Corporation (IFC) requirements and other World Bank standards. This exposure has allowed me to develop and implement a HRM approach that is founded on international best practice and leading international conservation bodies such as UNESCO and ICOMOS. I have worked in most South African Provinces, as well as Swaziland, the Democratic Republic of the Congo and Sierra Leone. I am fluent in English and Afrikaans, with excellent writing and research skills.

5 PROJECT EXPERIENCE

PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENTS:

- Above Ground Storage Tanks survey, SASOL Oil (Pty) Ltd, Free State Province, South Africa
- Access road establishment, AGES-SA, Tzaneen, South Africa
- Boikarabelo Railway Link, Resgen South Africa, Steenbokpan, South Africa
- Conversion of prospecting rights to mining rights, Georock Environmental, Musina, South Africa
- Galaxy Gold Agnes Mine, Barberton, South Africa
- HCI Khusela Palesa Extension, Bronkhorstspuit, South Africa
- Kennedy's Vale township establishment, AGES-SA, Steelpoort, South Africa
- Koidu Diamond Mine, Koidu Holdings, Koidu, Sierra Leone
- Lonmin Platinum Mine water pipeline survey, AGES-SA, Lebowakgomo, South Africa
- Mining right application, DERA Environmental, Hekpoort, South Africa
- Mogalakwena water pipeline survey, AGES-SA, Limpopo Province, South Africa
- Nzoro Hydropower Station, Environmental and Social Impact Assessment, DRC
- Randgold Kibali Gold Project, Environmental and Social Impact Assessment, Kibali, Democratic Republic of the Congo
- Randwater Vlakfontein-Mamelodi water pipeline survey, Archaeology Africa cc, Gauteng, South Africa
- Residential and commercial development, GO Enviroscience, Schoemanskloof, South Africa
- Temo Coal, Limpopo, South Africa
- Transnet Freight Line survey, Eastern Cape and Northern Cape, ERM, South Africa
- Van Reenen Eco-Agri Development Project, GO Enviroscience, South Africa
- Platreef Platinum Mine, Ivanhoe Nickel & Platinum, Mokopane, South Africa

MITIGATION PROJECTS:

- Mitigation of Iron Age archaeological sites: Kibali Gold Project, DRC

- Mitigation of Iron Age metalworking site: Koidu Diamond Mine, Sierra Leone
- Mitigation of Iron Age sites: Boikarabelo Coal Mine, South Africa
- Exploratory test excavations of alleged mass burial site: Rustenburg, Bigen Africa Consulting Engineers, South Africa
- Mitigation of Old Johannesburg Fort: Johannesburg Development Agency (JDA), South Africa
- Site monitoring and watching brief: Department of Foreign Affairs Head Office, Imbumba-Aganang Design & Construction Joint Venture, South Africa

GRAVE RELOCATION

- Du Preezhoek-Gautrain Construction, Bombela JV, Pretoria, South Africa
- Elawini Lifestyle Estate social consultation, PGS (Pty) Ltd, Nelspruit, South Africa;
- Motaganeng social consultation, PGS (Pty) Ltd Burgersfort, South Africa
- Randgold Kibali Mine, Relocation Action Plan, Kibali, DRC
- Repatriation of Mapungubwe National Park and World Heritage Site, DEAT, South Africa
- Smoky Hills Platinum Mine social consultation, PGS (Pty) Ltd Maandagshoek South Africa
- Southstock Colliery, Doves Funerals, Witbank, South Africa
- Tygervallei. D Georgiades East Farm (Pty) Ltd, Pretoria, South Africa
- Willowbrook Ext. 22, Ruimsig Manor cc, Ruimsig, South Africa
- Zondagskraal social consultation, PGS (Pty) Ltd, Ogies, South Africa
- Zonkezizwe Gautrain, PGS, (Pty) Ltd, Midrand, South Africa

OTHER HERITAGE ASSESSMENTS AND REVIEWS:

- Heritage Scoping Report on historical landscape and buildings in Port Elizabeth: ERM South Africa
- Heritage Statement and Cultural Resources Pre-assessment scoping report on Platreef Platinum Mine, Mokopane: Platreef Ltd
- Heritage Statement and Scoping Report on five proposed Photo Voltaic Solar Power farms, Northern Cape and Western Cape: Orlight SA
- Land claim research Badenhorst family vs Makokwe family regarding Makokskraal, Van Staden, Vorster & Nysschen Attorneys, Ventersdorp South Africa
- Research report on Cultural Symbols, Ministry for Intelligence Services, Pretoria, South Africa
- Research report on the location of the remains of kings Mampuru I and Nyabela, National Department of Arts and Culture, Pretoria, South Africa
- Review of Archaeological Assessment: Resources Generation, Coal Mine Project in the Waterberg area, Limpopo Province

- Review of CRM study and compilation of Impact Assessment report, Zod Gold Mine, Armenia

6 PROFESSIONAL AFFILIATIONS

Society for Africanist Archaeologists (SAfA)

7 PROFESSIONAL REGISTRATION

Association fo Southern African Professional Archaeologists (ASAPA)

Accredited by ASAPA Cultural Resources Management section

International Association of Impact Assessors (IAIA)

8 PUBLICATIONS

Nel, J. 2001. Cycles of Initiation in Traditional South African Cultures. *South African Encyclopaedia* (MWEB).

Nel, J. 2001. *Social Consultation: Networking Human Remains and a Social Consultation Case Study*. Research poster presentations at the Bi-annual Conference (SA3) Association of Southern African Professional Archaeologists: National Museum, Cape Town.

Nel, J. 2002. *Collections policy for the WG de Haas Anatomy museum and associated Collections*. Unpublished. Department of Anatomy, School of Medicine: University of Pretoria.

Nel, J. 2004. Research and design of exhibition for Eloff Belting and Equipment CC for the Institute of Quarrying 35th Conference and Exhibition on 24 – 27 March 2004.

Nel, J. 2004. *Ritual and Symbolism in Archaeology, Does it exist?* Research paper presented at the Bi-annual Conference (SA3) Association of Southern African Professional Archaeologists: Kimberley

Nel, J & Tiley, S. 2004. The Archaeology of Mapungubwe: a World Heritage Site in the Central Limpopo Valley, Republic of South Africa. *Archaeology World Report*, (1) United Kingdom p.14-22.

Nel, J. 2007. *The Railway Code: Gautrain, NZASM and Heritage*. Public lecture for the South African Archaeological Society, Transvaal Branch: Roedean School, Parktown.

Nel, J. 2009. *Un-archaeologically speaking: the use, abuse and misuse of archaeology in popular culture*. *The Digging Stick*. April 2009. 26(1): 11-13: Johannesburg: The South African Archaeological Society.

Nel, J. 2011. 'Gods, Graves and Scholars' returning Mapungubwe human remains to their resting place.' In: *Mapungubwe Remembered*. University of Pretoria commemorative publication: Johannesburg: Chris van Rensburg Publishers.

Nel, J. 2012. *HIAs for EAPs*. Paper presented at IAIA annual conference: Somerset West.

SHAHZAADEE KARODIA KHAN

Mrs Shahzaadee Karodia Khan

Assistant Heritage Consultant: Palaeontological Specialist

Social Science Department

Digby Wells Environmental

1 EDUCATION

- 2006 BA Anthropology & Archaeology, University of the Witwatersrand
- 2007 BSc Honours. Palaeontology, University of the Witwatersrand
 - Courses included: comparative vertebrate anatomy; cladistics analysis; primate and human evolution; Karoo biostratigraphy; dinosaurs and the origins of birds; Cenozoic mammals; taphonomy; and palaeoecology
 - Honours Thesis: "Encephalization and its relationship to orbit size in modern humans and a small bodied population from Palau, Micronesia".
- 2012 MSc Archaeology, University of the Witwatersrand
 - MSc Thesis: "Naturally mummified human remains from Historic Cave, Limpopo, South Africa".
 - Skills obtained during MSc included: stereo microscopy; light microscopy; scanning electron microscopy; and histology

2 LANGUAGE SKILLS

- English (read, write, speak)
- Currently completing French training for beginners

3 EMPLOYMENT

2012:	Archaeology consultant, Digby Wells Environmental
April 2012 – June 2012:	External archaeology research consultant, EcoAfrica
April 2011 – November 2011:	Archaeology intern, University of Pretoria
2007 – 2008:	Palaeontology collections assistant, BPI University of the Witwatersrand
2006 – 2007:	Tour guide, Sterkfontein Caves

4 EXPERIENCE

- Archaeology Field School in Klipriviersberg with Dr Karim Sadr, University of the Witwatersrand
- Archaeology Field School in Swartkrans and Maropeng with Dr Kathy Kuman, University of the Witwatersrand
- Archaeology Field School in Ottosdaal with Dr Thembi Russell, University of the Witwatersrand
- Palaeontology Field School in the Karoo with Professor Bruce Rubidge, University of the Witwatersrand
- Palaeontology Field School in Gladysvale with Professor Lee Berger, University of the Witwatersrand
- Palaeontology Field School in Wonderkrater with Dr Lucinda Backwell, University of the Witwatersrand

5 PROJECT EXPERIENCE

Project Title	Client	Role
Heritage Statement for the Central Basin, Witwatersrand AMD Project	AECOM	Heritage Specialist & Report Writer
Heritage Impact Assessment for the Witwatersrand Gold Fields Acid Mine Drainage Project (Western Basin)	AECOM	Heritage Specialist & Report Writer
Heritage Statement for the Dalyshope Project: Phase 1 NEMA Application, Lephalale, Limpopo Province	Anglo American Thermal Coal	Heritage Specialist & Report Writer
Archaeological Watching Brief on Access Road	Bokoni Platinum Mine	Heritage Specialist & Report Writer
Heritage Impact Assessment for the Proposed Bokoni Klipfontein Opencast Mine Project, Klipfontein 465 KS, Sekhukhune, Limpopo Province	Bokoni Platinum Mine	Heritage Specialist & Report Writer
Heritage Statement for Rhodium Reef Limited Platinum Operation, Limpopo Province	EastPlats Group	Palaeontological Specialist
Heritage Screening Assessment for the Kangra Coal Project	ERM	Palaeontological Specialist
Heritage Impact Assessment for the Kangra Coal Project	ERM	Heritage Specialist & Report Writer
Heritage Statement for the Thabametsi Project, Lephalale, Limpopo Province	Exxaro Coal	Heritage Specialist & Report Writer
Heritage Impact Assessment for the Proposed Thabametsi Project, Lephalale, Limpopo Province	Exxaro Coal	Heritage Specialist & Report Writer
Heritage Statement for Eskom Transmission Division – Roodepoort Strengthening Project	Fourth Element	Heritage Specialist & Report Writer

Project Title	Client	Role
Phase 1 Heritage Impact Assessment of the Proposed Geluksdal Tailings Storage Facility and Pipeline	Gold One International Limited	Heritage Specialist & Report Writer
Heritage Statement Report for the Kosmosdal Sewer Pipe Bridge Upgrade	Iliso Consulting	Palaeontological Specialist
Heritage Statement Report for the Wilgespruit Bridge Upgrade	Iliso Consulting	Palaeontological Specialist
Heritage Statement for Atcom And Tweefontein Dragline Relocation Project	Jones and Wagener Consulting Civil Engineers	Palaeontological Specialist
Heritage Statement for the Consbrey Colliery	Msobo Coal	Heritage Specialist & Report Writer
Heritage Statement for the Harwar Colliery	Msobo Coal	Heritage Specialist & Report Writer
Heritage Impact Assessment for the Consbrey Colliery Project, Mpumalanga Province	Msobo Coal	Palaeontological Specialist
Heritage Impact Assessment for the Harwar Colliery Project, Mpumalanga Province	Msobo Coal	Heritage Specialist & Report Writer
Heritage Statement for the Waterberg Prospecting Rights Application, Blouberg, Limpopo Province	Platinum Group Metals	Heritage Specialist & Report Writer
Heritage Statement for the Platreef Platinum Project, Mokopane, Limpopo Province	Platreef Resources	Heritage Specialist & Report Writer
Heritage Statement for the Rhodium Reef Limited Platinum Operation, Limpopo Province	Rhodium Reefs	Palaeontological Specialist
Heritage Statement for the Vedanta IPP Project, Lephalale, Limpopo Province	Vedanta Zinc International	Heritage Specialist & Report Writer

Project Title	Client	Role
Heritage Statement for the Zandbaken Coal Mine Project, Standerton, Mpumalanga Province	Xstrata Coal South Africa	Heritage Specialist & Report Writer

6 PROFESSIONAL AFFILIATIONS

- Association of Southern African Professional Archaeologists (ASAPA)
- Geological Survey of South Africa (GSSA)
- Golden Key Society
- Palaeontological Society of Southern Africa (PSSA)
- South African Archaeology Society (SAAS)
- Society of Africanist Archaeologists (SAfA)
- South African Society for Amateur Palaeontologists (SASAP)

Appendix B: Location and Site Maps

Sasol Sigma Ash Backfilling Regional Setting

Legend

★ Project Location

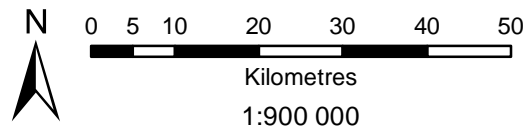


Project Location



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

Geographic Coordinate System Ref #: anp.SAS1691.201310.158
Datum: WGS84 Revision Number: 1
Date: 18/10/2013



Sasol Sigma Ash Backfilling Regional Setting 1:50 000 Topo Map

Legend

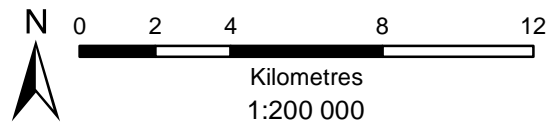
- Potential Ash & Water Pipeline
- Existing Ash & Water Pipeline

1: 50 000 Topo Sheets:
2627DC
2627DD



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

Projection: Transverse Mercator Ref #: anp.SAS1691.201310.159
Datum: WGS84 Revision Number: 1
Central Meridian: 27°E Date: 18/10/2013



Sasol Sigma Ash Backfilling

Regional Setting 1:10 000 Aerial Photos

Legend

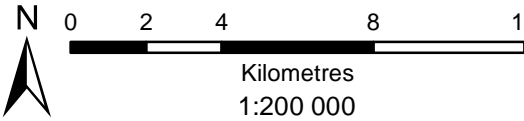
- Potential Ash & Water Pipeline
- Existing Ash & Water Pipeline

2627DC
2627DD



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

Projection: Transverse Mercator Ref #: anp.SAS1691.201310.160
Datum: WGS84 Revision Number: 1
Central Meridian: 27°E Date: 18/10/2013



Sasol Sigma Ash Backfilling

Geological Setting

Legend


- Major Town
- ⊙ Secondary Town
- Other Town
- Settlement
- Main Road
- National Road
- Rivers

Pipeline Layout

- Potential Ash & Water Pipeline
- Existing Ash & Water Pipeline

Regional Geology

- Adelaide Sbgrp, Beaufort Grp
- Baviaanskranz Granite
- Black Reef Fm, Transvaal Spgrp
- Dominion Grp
- Government Sbgrp, West Rand Grp
- Hospital Hill Sbgrp, West Rand Grp
- Inlandsee Leucogranofels/Gneiss
- Jeppesfontein Sbgrp, West Rand Grp
- Johannesburg Sbgrp, Central Rand Grp
- Kaffirskraal Cplx
- Kalkwerf Gneiss
- Karoo Dolerite Sui
- Klipriviersberg Grp, Ventersdorp Spgrp
- Losberg Cplx
- Madzaringwe Fm, Karoo Spgrp
- Magaliesberg Fm, Pretoria Grp
- Malmani Sbgrp, Chuniespoort Grp
- Pretoria Grp, Transvaal Spgrp
- Rietfontein Cplx
- Schurwedraai Alkali Granite
- Silverton Fm, Pretoria Grp
- Swazian Erathem
- Turfontein Sbgrp, Central Rand Gr
- Vaalian Erathem
- Volkstrust Fm, Eccia Grp
- Witwatersrand Spgrp

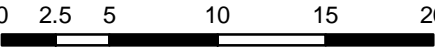



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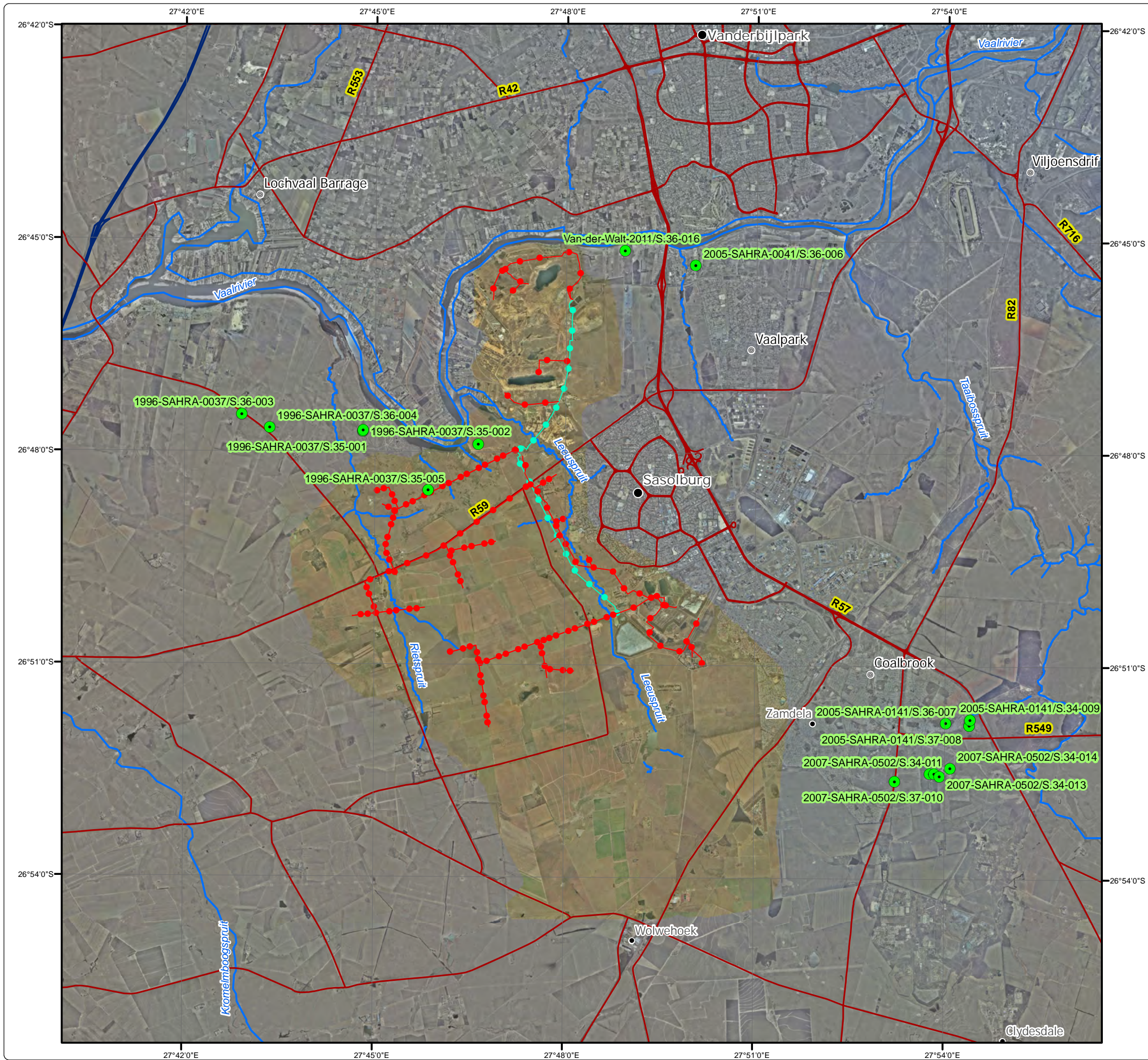
• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Transverse Mercator	Ref #: anp.SAS1691.201310.161
Datum: WGS84	Revision Number: 1
Central Meridian: 27°E	Date: 30/09/2013

N



0 2.5 5 10 15 20
Kilometres
1:350 000



Sasol Sigma Ash Backfilling

Heritage Resources

Legend

- Heritage Resources
- Major Town
- Secondary Town
- Other Town
- Settlement

- Main Road
- National Road
- Rivers

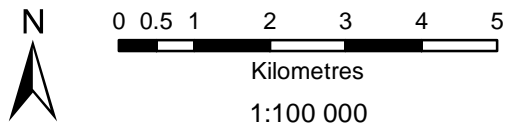
Pipeline Layout

- Potential Ash & Water Pipeline
- Existing Ash & Water Pipeline



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

Projection: Transverse Mercator Ref #: anp.SAS1691.201310.162
Datum: WGS84 Revision Number: 1
Central Meridian: 27°E Date: 18/10/2013



Appendix C: Site List of Identified Heritage Resources in the Project and Study Areas

Site Table List

Site Name	Description	Longitude	Latitude
1996-SAHRA-0037/S.35-001	Late Stone Age	27.746778	-26.795278
1996-SAHRA-0037/S.35-002	Late Iron Age	27.746806	-26.795000
1996-SAHRA-0037/S.36-003	Burial Ground	27.714917	-26.791333
1996-SAHRA-0037/S.36-004	Burial Ground	27.722333	-26.794444
1996-SAHRA-0037/S.35-005	Late Iron Age	27.763972	-26.809111
2005-SAHRA-0041/S.36-006	Burial Ground	27.833889	-26.755833
2005-SAHRA-0141/S.36-007	Monument	27.900278	-26.863333
2005-SAHRA-0141/S.37-008	Burial Ground	27.906389	-26.863889
2005-SAHRA-0141/S.34-009	Built Environment	27.906667	-26.862500
2007-SAHRA-0502/S.37-010	Monument	27.886861	-26.877056
2007-SAHRA-0502/S.34-011	Built Environment	27.896056	-26.875222
2007-SAHRA-0502/S.34-012	Built Environment	27.897278	-26.875222
2007-SAHRA-0502/S.34-013	Built Environment	27.898611	-26.875861
2007-SAHRA-0502/S.34-014	Built Environment	27.901472	-26.873944
Van-der-Walt-2009/S.36-015	Burial Ground	27.777097	-26.798238
Van-der-Walt-2011/S.36-016	Burial Ground	27.815370	-26.752440
2008-SAHRA-0323/S.34-017	Built Structure	28.922267	-26.629767
2008-SAHRA-0323/S.34-018	Built Structure	28.922017	-26.630033
2008-SAHRA-0323/S.34-019	Built Structure	28.922433	-26.626950
2008-SAHRA-0323/S.34-020	Built Structure	29.137970	-26.635230
2008-SAHRA-0323/S.34-021	Built Structure	28.929720	-26.633400
2008-SAHRA-0323/S.34-022	Built Structure	28.912070	-26.625150
2008-SAHRA-0323/S.34-023	Built Structure	28.905370	-26.633380
2008-SAHRA-0323/S.34-024	Built Structure	28.859250	26.602300
2008-SAHRA-0323/S.34-025	Built Structure	28.740950	-26.656430
2008-SAHRA-0323/S.34-026	Built Structure	28.731380	-26.665720
2008-SAHRA-0323/S.34-027	Built Structure	28.731030	-26.665380
2008-SAHRA-0323/S.36-028	Built Structure	28.461830	-26.748350
2008-SAHRA-0323/S.34-029	Burial Ground	28.974850	-26.632280
2008-SAHRA-0323/S.34-030	Burial Ground	28.940180	-26.631130
2008-SAHRA-0323/S.34-031	Burial Ground	28.934420	-26.632800
2008-SAHRA-0323/S.34-032	Burial Ground	28.921800	-26.628120
2008-SAHRA-0323/S.34-033	Burial Ground	28.899330	-26.634120
2008-SAHRA-0323/S.34-034	Burial Ground	28.909550	-26.625970
2008-SAHRA-0323/S.34-035	Burial Ground	29.803620	-26.613830
2008-SAHRA-0323/S.34-036	Burial Ground	28.974130	-26.633570
2008-SAHRA-0323/S.34-037	Burial Ground	28.736870	-26.676430
2008-SAHRA-0323/S.34-038	Burial Ground	28.463900	-26.742880

Site Table List

Heritage Statement for the Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg,
Free State Province

SAS1691

Site Name	Description	Longitude	Latitude
2008-SAHRA-0323/S.34-039	Burial Ground	28.463000	-26.749070
2008-SAHRA-0323/S.34-040	Burial Ground	28.458220	-26.748930
2008-SAHRA-0323/S.34-041	Burial Ground	28.461350	-26.750220
2008-SAHRA-0323/S.34-042	Burial Ground	28.447800	-26.747400

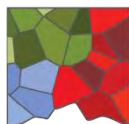
Appendix D: Chance Find Procedures



**CHANCE FIND PROCEDURES (CFPS)
FOR THE SASOL MINING SIGMA
COLLIERY ASH BACKFILLING
PROJECT, SASOLBURG, FREE STATE
PROVINCE**

SASOL MINING (PTY) LTD

15 NOVEMBER 2013





DIGBY WELLS
ENVIRONMENTAL

This document has been prepared by **Digby Wells Environmental**.

Report Title: **Chance Find Procedures (CFPs) for the Sasol Mining
Sigma Colliery Ash Backfilling Project, Sasolburg, Free
State Province**

Project Number: **SAS1691 CFPs Document**

Name	Responsibility	Signature	Date
Justin du Piesanie: HRM Specialist	CFPs Compiler		15 November 2013
Shahzaadee Karodia Khan	Palaeontologist		15 November 2013

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



ACRONYMS

BGG	Burial Grounds and Graves
CFPs	Chance Find Procedures
CL	Community Liaison
Digby Wells	Digby Wells Environmental
EC	Environmental Control
FSPHRA	Free State Provincial Heritage Resources Authority
HIA	Heritage Impact Assessment
HRM	HRM Resources Management
HS	Health and Safety
ICOMOS	International Council on Monuments and Sites
MA	Monitoring Archaeologist
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
SAHRA	South African Heritage Resources Authority
SAPS	South African Police Service
UNESCO	United Nations Educational, Scientific and Cultural Organisation

TABLE OF CONTENTS

1	INTRODUCTION	1
2	DEFINITIONS	1
3	CHANCE FIND PROCEDURES	1
3.1	INITIAL IDENTIFICATION AND/OR EXPOSURE	1
3.2	CHANCE FIND PROCEDURES: HERITAGE RESOURCES.....	2
3.3	CHANCE FIND PROCEDURES: PALAEOLOGY	2
3.3.1	<i>Isolated Bone Finds</i>	2
3.3.2	<i>Bone Cluster Finds</i>	3
3.3.3	<i>Rescue Excavation</i>	4
3.3.4	<i>Major Finds</i>	4
3.3.5	<i>Exposure of Fossil Shell Beds</i>	5
3.3.6	<i>Exposure of Fossil Wood and Peats</i>	6
3.3.7	<i>Monitoring for Fossils</i>	6
3.4	CHANCE FIND PROCEDURES: BGG.....	7
4	CONCLUSION	8

1 INTRODUCTION

The purpose of this document is to provide Sasol Mining (Pty) Ltd (Sasol) and their contractors with the appropriate response guidelines (extracted and adapted from the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) Regulations Reg No. 6820, GN: 548, taking into consideration international best practice based on World Bank, Equator Principles and the International Finance Corporation Performance Standards, 1972 UNESCO Convention on the Protection of World Cultural and Natural Heritage (World Heritage Convention), ICOMOS Guideline on Heritage Impact Assessment and the Australian ICOMOS Burra Charter (1999)) that should be implemented in the event of chance discovery of heritage resources. These guidelines or Chance Find Procedures (CFPs) and Fossil Find Procedures (FFPs) can be incorporated into Sasol policies that may have relevance during construction and operational phases.

The CFPs and FFPs presented by Digby Wells Environmental (Digby Wells) aim to avoid and/or reduce project risks that may result due to chance finds, whilst considering international best practice.

2 DEFINITIONS

For simplicity, the term 'heritage resource' includes structures, archaeology, meteors, and public monuments as defined in the South African National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) Section 34, Section 35 and Section 37. Procedures specific to palaeontological fossils (Section 35 of NHRA) and burial grounds and graves (BGG) as defined under NHRA Section 36 will be discussed separately as these require the implementation of separate criteria for CFPs.

3 CHANCE FIND PROCEDURES

The following procedural guidelines must be considered in the event that previously unknown heritage resources or BGG are exposed or found during the life of the project.

3.1 Initial Identification and/or Exposure

Heritage resources or BGG may be identified during construction or accidentally exposed. The initial procedure when such sites are found aim to avoid any further damage. The following steps and reporting structure must be observed in both instances:

1. The person or group (identifier) who identified or exposed the burial ground must cease all activity in the immediate vicinity of the site;
2. The identifier must immediately inform his/her supervisor of the discovery;
3. The supervisor must ensure that the site is secured and control access; and

4. The supervisor must then inform the relevant Sasol personnel responsible for at least the following portfolios: Community Liaison (CL), Environmental Control (EC) and Health and Safety (HS).

3.2 Chance Find Procedures: Heritage Resources

In the event that previously unidentified heritage resources are identified and / or exposed during construction or operation of the Sigma Colliery project, the following steps must be implemented subsequent to those outlined under Section 3.1 above:

1. The Digby Wells Environmental (Digby Wells) project manager and / or Heritage Resources Management (HRM) Unit must be notified of the discovery;
2. Digby Wells will assign a qualified specialist to consider the heritage resource, either via communicating with the EC Officer via telephone or email, or based on a site visit;
3. Appropriate measures will then be presented to Sasol;
4. Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) Section 34, Section 35 and Section 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), Digby Wells will notify the South African Heritage Resources Agency (SAHRA) and / or the Free State Provincial Heritage Resources Authority (FSPHRA) on behalf of Sasol; and
5. Based on the comments received from SAHRA and / or FSPHRA, Digby Wells will provide Sasol with a Terms of References Report and relevant associated costs if necessary.

3.3 Chance Find Procedures: Palaeontology

3.3.1 Isolated Bone Finds

In the process of digging excavations, isolated bones may be spotted in the hole sides or bottom, or as they appear on the spoil heap. By this is meant bones that occur singly, in different parts of the excavation. If the number of distinct bones exceeds six pieces, the finds must be treated as a bone cluster (below).

3.3.1.1 Response of personnel

The following responses should be undertaken by personnel in the event of isolated bone finds:

- **Action 1:** An isolated bone exposed in an excavation or spoil heap must be retrieved before it is covered by further spoil from the excavation and set aside;
- **Action 2:** The site foreman and EC Officer must be informed;

- **Action 3:** The responsible field person (site foreman or EC Officer) must take custody of the fossil. The following information is to be recorded:
 - Position (excavation position);
 - Depth of find in hole;
 - Digital image of hole showing vertical section (side); and
 - Digital image of fossil.
- **Action 4:** The fossil should be placed in a bag (e.g. a Ziploc bag), along with any detached fragments. A label must be included with the date of the find, position information, and depth; and
- **Action 5:** The EC Officer is to inform the developer who then contacts the archaeologist and/or palaeontologist contracted to be on standby. The EC Officer is to describe the occurrence and provide images via email.

3.3.1.2 Response by Palaeontologist

The palaeontologist will assess the information and liaise with the developer and the EC Officer and a suitable response will be established.

3.3.2 Bone Cluster Finds

A bone cluster is a major find of bones (e.g. several bones in close proximity or bones resembling parts of a skeleton). These bones will likely be seen in broken sections of the sides of the hole and as bones appearing in the bottom of the hole and on the spoil heap.

3.3.2.1 Response of personnel

The following responses should be undertaken by personnel in the event of bone cluster finds:

- **Action 1:** Immediately stop excavation in the vicinity of the potential material. Mark or flag the position as well as the spoil heap that may contain fossils;
- **Action 2:** Inform the site foreman and the EC Officer; and
- **Action 3:** The EC Officer is to inform the developer who must then contact the archaeologist and/or palaeontologist contracted to be on standby. The EC Officer is then to describe the occurrence and provide images via email.

3.3.2.2 Response by Palaeontologist

The palaeontologist will assess the information and liaise with the developer and the EC Officer and a suitable response will be established. It is likely that a Field Assessment by the palaeontologist will be carried out.

It will be probably be feasible to avoid the find and continue to the excavation farther along, or proceed to the next excavation, so that the work schedule is minimally disrupted. The

response time / scheduling of the Field Assessment is to be decided in consultation with the developer / owner and the environmental consultant.

The Field Assessment could have the following outcomes:

- If a human burial, the appropriate authority is to be contacted. The find must be evaluated by a human burial specialist to decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in an archaeological context, an archaeologist must be contacted to evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in a palaeontological context, the palaeontologist must evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.

3.3.3 Rescue Excavation

Rescue Excavation refers to the removal of the material from the “design” excavation. This would apply if the amount or significance of the exposed material appears to be relatively circumscribed and it is feasible to remove it without compromising contextual data. The time span for Rescue Excavation should be reasonable rapid to avoid any undue delays, e.g. one to three days and definitely less than one week.

In principle, the strategy during the mitigation is to “rescue” the fossil material as quickly as possible. The strategy to be adopted depends on the nature of the occurrence, particularly the density of the fossils. The methods of collection would depend on the preservation or fragility of the fossil and whether in loose or in lithified sediment. These could include:

- On-site selection and sieving in the case of robust material in sand; and
- Fragile material in loose sediment would be encased in blocks using Plaster-of-Paris or reinforced mortar.

If the fossil occurrence is dense and is assessed to be a “Major Find”, a carefully controlled excavation is required.

3.3.4 Major Finds

A Major Find is the occurrence of material that, by virtue of quantity, importance and time constraints, cannot be feasibly rescued without compromise of detailed material recovery and contextual observations.

3.3.4.1 Management options for major finds

In consultation with the developer/owner and the environmental consultant, the following options should be considered when deciding on how to proceed in the event of a Major Find.

Option 1: Avoidance

Avoidance of the Major Find through project redesign or relocation. This ensures minimal impact to the site and is the preferred option from a heritage resource management

perspective. When feasible, it can also be the least expensive option from a construction perspective.

The find site will require site protection measures, such as erecting fencing or barricades. Alternatively, the exposed finds can be stabilised and the site refilled or capped. The latter is preferred if excavation of the find will be delayed substantially or indefinitely. Appropriate protection measures should be identified on a site-specific basis and in wider consultation with the heritage and scientific communities.

This option is preferred as it will allow the later excavation of the finds with due scientific care and diligence.

Option 2: Emergency Excavation

Emergency excavation refers to the “no option” situation where avoidance is not feasible due to design, financial and time constraints. It can delay construction and emergency excavation itself will take place under tight time constraints, with the potential for irrevocable compromise of scientific quality. It could involve the removal of a large, disturbed sample by an excavator and conveying this by truck from the immediate site to a suitable place for “stockpiling”. This material could then be processed later.

Consequently, the emergency excavation is not the preferred option for a Major Find.

3.3.5 Exposure of Fossil Shell Beds

3.3.5.1 Response of personnel

The following responses should be undertaken by personnel in the event of intersection with fossil shell beds:

- **Action 1:** The site foreman and EC Officer must be informed;
- **Action 2:** The responsible field person (site foreman or EC Officer) must record the following information:
 - Position (excavation position);
 - Depth of find in hole;
 - Digital image of the hole showing the vertical section (side); and
 - Digital images of the fossiliferous material.
- **Action 3:** A generous quantity of the excavated material containing the fossils should be stockpiled near the site, for later examination and sampling;
- **Action 4:** The EC Officer is to inform the developer who must then contact the archaeologist and/or palaeontologist contracted to be on standby. The EC Officer is to describe the occurrence and provide images via email.

3.3.5.2 Response by Palaeontologist

The palaeontologist will assess the information and liaise with the developer and the EC Officer and a suitable response will be established. This will most likely be a site visit to document and sample the exposure in detail, before it is covered up.

3.3.6 Exposure of Fossil Wood and Peats

3.3.6.1 Response of personnel

The following responses should be undertaken by personnel in the event of exposure of fossil wood and peats:

- **Action 1:** The site foreman and EC Officer must be informed;
- **Action 2:** The responsible field person (site foreman or EC Officer) must record the following information:
 - Position (excavation position);
 - Depth of find in hole;
 - Digital image of the hole showing the vertical section (side); and
 - Digital images of the fossiliferous material.
- **Action 3:** A generous quantity of the excavated material containing the fossils should be stockpiled near the site, for later examination and sampling;
- **Action 4:** The EC Officer is to inform the developer who must then contact the archaeologist and/or palaeontologist contracted to be on standby. The EC Officer is to describe the occurrence and provide images via email.

3.3.6.2 Response by Palaeontologist

The palaeontologist will assess the information and liaise with the developer and the EC Officer and a suitable response will be established. This will most likely be a site visit to document and sample the exposure in detail, before it is covered up.

3.3.7 Monitoring for Fossils

A regular monitoring presence over the period during which excavations are made, by either an archaeologist or palaeontologist, is generally not practical.

The field supervisor or foreman and workers involved in digging excavations must be encouraged and informed of the need to watch for potential fossil and buried archaeological material. Workers seeing potential objects are to report to the field supervisor who, in turn, will report to the EC Officer. The EC Officer will inform the archaeologist and/or palaeontologist contracted to be on standby in the case of fossil finds.

To this end, responsible persons must be designated. This will include hierarchically:

- The field supervisor or foreman who is going to be most often in the field;
- The EC Officer for the project;
- The Project Manager

Should the monitoring of excavations be stipulated in the Archaeological Impact Assessment and/or the Heritage Impact Assessment, the contracted Monitoring Archaeologist (MA) can also monitor for the presence of fossils and make a field assessment of any material brought to attention. The MA is usually sufficiently informed to identify fossil material and this avoids additional monitoring by a palaeontologist. In shallow coastal excavations, the fossils encountered are usually in an archaeological context.

The MA then becomes the responsible field person and fulfils the role of liaison with the palaeontologist and coordinates with the developer and the EC Officer. If fossils are exposed in non-archaeological contexts, the palaeontologist should be summoned to document and sample/collect them.

3.4 Chance Find Procedures: BGG

In the event that previously unidentified BGG are identified and/or exposed during construction or operation of the Sigma Colliery project, the following steps must be implemented subsequent to those outlined under Section 3.1 above:

1. The Digby Wells project manager and / or the HRM Unit must immediately be notified of the discovery in order to take the required further steps:
 - i. The local South African Police Service (SAPS) will be notified on behalf of Sasol;
 - ii. Digby Wells will deploy a suitably qualified specialist to inspect the exposed burial and determine in consultation with the SAPS:
 - The temporal context of the remains, i.e.:
 - a. forensic,
 - b. authentic burial grave (informal or older than 60 years, NHRA (1999) Section 36); or
 - c. archaeological (older than 100 years, NHRA (1999) Section 38); and
 - If any additional graves may exist in the vicinity.
2. Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) Section 36 and NHRA (1999) Regulations (Regulation 38, 39, 40), Digby Wells will notify SAHRA and / or FSPHRA on behalf of Sasol;
3. SAHRA / FSPHRA may require that an identification of interested parties, consultation and / or grave relocation take place;

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4. Consultation must take place in terms of NHRA (1999) Regulations 39, 40, 42; and
 5. Grave relocation must take place in terms of NHRA (1999) Regulations 34.

4 CONCLUSION

The CFP's presented in this document serve as international best practice policy for the accidental discovery of heritage resources and BGG. Based on the definitions provided within this document and the proposed lines of communication, Sasol will be able to mitigate the accidental discovery of heritage resources and BGG throughout the various phases of the project. Where necessary, Digby Wells is available to assist with the recommendation of mitigations for the accidental discovery of heritage resources and BGG.