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Basic Assessment Report and Environmental Management Programme for Environmental Authorisation for the Proposed Rehabilitation at Eskom Kilbarchan Colliery, Newcastle, KwaZulu-Natal

Heritage Basic Assessment Report

Project Number:

ESK3520

Prepared for:

Eskom Holdings SOC Limited

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EXECUTIVE SUMMARY

Digby Wells Environmental (hereinafter Digby Wells) was requested to provide specialist services to complete a Basic Assessment (BA) process to ensure that the Kilbarchan Colliery is rehabilitated to ensure it is socially and environmentally safe and sustainable. To this effect, a BA Report (BAR) was compiled in aid of the identification of impacts associated with the rehabilitation of the Kilbarchan Colliery. As part of the suite of specialist studies undertaken as part of the BA process, a Heritage Resources Management (HRM) process was required to adhere to the South African legal framework.

Rehabilitation activities at the Kilbarchan Colliery have previously been undertaken. This included rehabilitation of the following:

- Discard dump approximately 70 ha in size;
- Open Pit area 1A; and
- Open Pit area 2.

These areas require additional rehabilitation actions. Although most of the areas are stable and showing signs of successful restoration, erosion hotspots are present and need to be addressed. Proposed additional rehabilitation activities included the following:

Component	Description
Landfill sites	Two apparent landfill sites were identified in the project area consisting of waste materials such as tyres, concrete and other refuse. One landfill site is located on the western flank of the Discard Dump, with the second landfill site being located to the east of the Discard Dump between the N11 highway and the Ingagane River. The full extent of the landfill sites, as well as the nature of materials contained within the landfills, will have to be ascertained before the sites can be closed. The western landfill site is subject to erosion, with the eastern landfill site displaying evidence of subsidence and both requiring rehabilitation. The possibility of Polychlorinated Biphenyls (PCBs) and asbestos being buried within these landfill sites poses a potential risk to the successful rehabilitation of Kilbarchan Colliery.
Subsidence	Surface subsidence has occurred in two identified locations within the Kilbarchan Colliery mining area and results in impeded drainage and the ponding of water, as well as having occurred at key points in a contour bank that may cause the bank to fail in the near future. The subsidence has occurred at the historic Open Pit areas of the mine and all subsidence areas should be investigated further.

Primary (i.e. field-based) data are based on a pre-disturbance survey completed by Digby Wells in October 2014 for a proposed long term active treatment option for mine affected water at Kilbarchan Colliery. No additional primary data collection was completed for the

compilation of this Heritage BAR (HBAR) in terms of the proposed aforementioned Kilbarchan Colliery rehabilitation activities. Therefore, the site specific study area under assessment here has not been subject to primary data collection and the potential for unidentified heritage resources to occur within or in proximity to the area of development exists. This notwithstanding identified heritage resources within the site specific study area and their associated Cultural Significance and Field Ratings include the following:

Type	Resource ID	Cultural Significance	Field Rating
Burial / grave	BGG/001a	Very High	General Protection IV A
	BGG/001b		
	BGG/003		
	BGG/005		
Site	St/001	Medium	General Protection IV B
	St/002	Negligible	General Protection IV C
Structure	Ste/004	Medium High	Grade II

The identified rehabilitation activities are not envisaged to have impacts to heritage resources as these will comprise of the following:

- Rehabilitation of the discard dump that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources;
- Rehabilitation of the Open Pit area 1C and 2 that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources;
- Rehabilitation of the east and west landfill sites that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources; and
- The establishment of the phytoremediation plantation in an area that has previously been altered through agrarian and other anthropogenic activities thereby reduced the potential for *in situ* heritage resources, or impacts to heritage resources.

Based on our understanding of the cultural landscape potential impacts to heritage resources will be negligible. The following recommendations are made to be considered as conditions for approval of the BA process:

- Although the site specific area is underlain by the *Vryheid Formation*, which has a high sensitivity rating, the proposed activities will not impact on the formation. It is therefore recommended that any conditions exclude a Palaeontological Impact Assessment (PIA);
- All burial grounds and graves located on the Kilbarchan Colliery properties are to be conserved *in situ* on condition that detailed Conservation Management Plans (CMP) are developed and approved by the relevant HRAs; and

- In general, the above recommendations should be considered on condition that a detailed project-specific Chance Finds Protocol (CFP) is developed and approved that must be integrated in the Environmental Management Plan (EMP).

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1 Introduction

The Kilbarchan Colliery, located 10 km south of Newcastle in KawZulu-Natal, was commissioned in 1954 and operated by Trans Natal (*later Ingwe Coal*) until 1992 when it was decommissioned. Rehabilitation activities at the Kilbarchan Colliery commenced after decommissioning.

Digby Wells Environmental (hereinafter Digby Wells) was requested by Eskom Holdings SOC Limited (hereinafter Eskom) to provide specialist services to complete a Basic Assessment (BA) process to ensure that the Kilbarchan Colliery is socially and environmentally safe and sustainable. To this effect, a BA Report (BAR) was compiled in aid of the identification of impacts associated with the rehabilitation of the Kilbarchan Colliery.

This report constitutes the specialist Heritage Basic Assessment Report (HBAR) in support of the BA process in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014 and the requirements of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

2 Project background

Kilbarchan Colliery is located within the Newcastle Local Municipality (NLM) and Amajuba District Municipality (ADM) in the northwest corner of KwaZulu-Natal; the municipalities border the Free State and Mpumalanga provinces to the west and north respectively. The Project area is located between Newcastle town which is 10 km to the north, and Ntshingwayo Dam (previously known as Chelmsford Dam) 10 km to the south. Project location details are summarised in Table 2-1:

Table 2-1: Summary of project location

Province	KwaZulu-Natal
District Municipality	Amajuba District Municipality
Local Municipality	Newcastle Local Municipality
Town / Area	Newcastle

Property (ies)	Portion 12 of the farm Kilbarchan 2969; Portion 15 of the farm Kilbarchan 2969; Remaining Extent of the farm Kilbarchan 2969; Portion 6 of the farm Kilbarchan 2969; Portion 16 of the farm Kilbarchan 2969; Portion 20 of the farm Kilbarchan 2969; and Remaining Extent of Portion 3 of the farm Tiger Kloof 3333.

The Kilbarchan Colliery mining area is approximately 3 322 ha. Associated surface comprises a discard dump, an adjacent Pollution Control Dam (PCD) and electrical substation to its north. Remnant infrastructure and derelict buildings, that were once part of the Kilbarchan Colliery, are located west of the PCD and substation. The property on which the remnant infrastructure is situated has subsequently been sold to Blaizing Sun Investments 35 (Pty) Ltd. (Blaizing Sun) and is no longer the liability of Eskom. In the Agreement of Sale, Blaizing Sun records that they are aware of possible environmental risks involved with the property and undertake to indemnify Eskom against any claims should any of the risk events occur. Additional housing is located further west of the remnant infrastructure and is currently occupied. This village is also located on the property sold to Blaizing Sun.

Kilbarchan Colliery consisted of two underground mining sections: Roy Point[1] in the north and Kilbarchan in the south. Underground mining by means of the bord and pillar method commenced at the Kilbarchan Colliery in 1954. The average coal seam height was of 3.5 m. Early reports indicated that the extraction rate for the Colliery was 73% to 76%, but more recent reports suggested that the extraction rate was 50%; no detailed plans of the underground workings are available. The lower and more probable extraction rate of 50% is possibly due to the considerably greater depths of mining in the western extent of the Colliery, due to the increase in topography in this area, as well as the angle of the coal seam.

In addition to the predominant bord and pillar method utilised at Kilbarchan Colliery, stooping was undertaken in selected areas. To extend the Life of Mine (LoM), open pit mining was implemented where the coal seam was less than 20 metres below ground level (mbgl). Open Pits 1A and 1B are connected to the underground workings. The extent of the areas mined through the aforementioned methods are summarised in Table 2-2.

[1] Roy Point does not form part of this application as the liability falls outside Eskom's ambit of responsibility.

Table 2-2: Extent of mined areas

Description	Area (Ha)
Underground workings	1 262
Stooped areas	118
Area connecting the Open Pit with the underground workings	21
Ash-filled areas	101

Construction of Eskom's Ingagane Power Station began in 1959 and was completed in April 1963 when operations began. Kilbarchan Colliery supplied coal to the Natal inland market as well as to the Ingagane Power Station. However, from 1981 to 1987 coal was supplied solely to the latter. The Ingagane Power Station initiated decommissioning in 1990, where after Kilbarchan Colliery ceased all mining activities in 1992, with rehabilitation undertaken up until 2012.

Following the decommissioning of Kilbarchan Colliery in 1992, the underground workings, as well as open pit areas, began filling up with water at a rate of approximately 4 000 m^3 per day. Decant of mine affected water was first recorded in April 2004 and is predominantly taking place to the south, southeast and east of the Discard Dump, underground workings and Open Pit sections. The mine affected water is characterised as having high sodium and sulfate levels resulting in high electrical conductivity (EC) and total dissolved solids (TDS). In addition, there are also elevated levels of chloride, iron and manganese. The mine affected water has a negative impact on the surrounding water courses it comes into contact with, as it does not meet the Interim Water Quality Objectives 2008 (IWQO) of the Ngagane Catchment.

2.1 Project overview

Rehabilitation activities at the Kilbarchan Colliery have previously been undertaken. This included rehabilitation of the following:

- Discard dump approximately 70 ha in size;
- Open Pit area 1A;
- Open Pit area 2.

These areas require additional rehabilitation actions. Although most of the areas are stable and showing signs of successful restoration, erosion hotspots are present and need to be addressed.

Further to these infrastructures, there are additional areas of the Kilbarchan Colliery that are still in need of rehabilitation to conform to the requirements of the approved Rehabilitation Plan. These are listed in Table 2-3:

Table 2-3: Components still in need of rehabilitation

Component	Description
Landfill sites	Two apparent landfill sites were identified in the project area consisting of waste materials such as tyres, concrete and other refuse. One landfill site is located on the western flank of the Discard Dump, with the second landfill site being located to the east of the Discard Dump between the N11 highway and the Ingagane River. The full extent of the landfill sites, as well as the nature of materials contained within the landfills, will have to be ascertained before the sites can be closed. The western landfill site is subject to erosion, with the eastern landfill site displaying evidence of subsidence and both requiring rehabilitation. The possibility of Polychlorinated Biphenyls (PCBs) and asbestos being buried within these landfill sites poses a potential risk to the successful rehabilitation of Kilbarchan Colliery.
Subsidence	As a result of stooping of underground areas the possibility exists of physical surface disturbance which could lead to surface subsidence and damage to the natural environment as well as physical surface infrastructure. All potential subsidence areas should be investigated further.

Mine affected water began to decant in the defunct Colliery in April 2004. This is primarily associated with flow seepage from the Discard Dump, as well as existing water monitoring locations from the underground voids. Decant of the mine affected water is negatively impacting on the receiving catchment area. To manage this, Eskom has proposed the establishment of active water treatment facilities[2], as well as a passive treatment option that will make use of phytoremediation by planting trees in strategically selected locations.

It is proposed that the Phytoremediation Plantation be located upstream of the decant locations and within 52 ha of wetland habitat. The tree plantation is expected to absorb approximately 1 mega litre (Mℓ) of mine affected water per day based on forestry spacing, although it is expected that this quantity can increase should tree spacing be reduced. This reduction in decant volumes, along with water abstraction for active treatment, will aid in the decrease in underground water elevation below the decant elevation of 1 192 m.

[2] Active water treatment will be assessed as part of a separate EIA process. The proposed passive treatment option has, however, been included as part of this BA Process.

2.2 Listed and specific activities

The NEMA provides the environmental legal framework for South Africa. The listed activities that require environmental authorisation have been outlined in the EIA Regulations 2014. Together with the EIA Regulations, 2014, the Minister published the following Regulations in terms of Sections 24 and 24D of the NEMA:

- Regulation GN R. 983 – Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and must follow the Basic Assessment process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations;
- Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and must follow an EIA process as described in Regulation 21 to Regulation 24 of the NEMA EIA Regulations; and
- Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies. The undertaking of such activities within the stipulated provincial boundaries will require environmental authorisation and the Basic Assessment process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations will need to be followed.

The Listed Activities, as defined in the EIA Regulations, 2014, and specified activities applicable to the rehabilitation of the Kilbarchan Colliery are outlined in Table 2-4.

Table 2-4: Listed and Specified Activities for the Project

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice
Maintenance of historic rehabilitation measures completed on the Discard Dump	70 ha	Yes	Activity 19 - GNR 983
Maintenance of historic rehabilitation measures completed on the Open Pit area 1C and 2	58.24 ha	Yes	Activity 19 - GNR 983
Maintenance of historic rehabilitation measures completed on the East and West Landfill Sites	Eastern Landfill Site -2.27 ha[3]	Yes	Activity 19 - GNR 983
The establishment of the	175 ha	Yes	Activity 30 – GNR 983

[3] The extent of the landfill site in the east cannot be determined without intrusive investigation, potential contamination will be determined through groundwater monitoring

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice
phytoremediation Plantation			

3 Terms of reference

As stated in the introduction, Eskom requested Digby Wells to provide specialist services to complete the required BA process. The suite of specialist studies needed to include a HRM process. The HRM process needed to adhere to the legal framework discussed under Section 4 below.

4 Legal and policy framework

The HRM process is governed by the national legislative framework. This section provides a brief summary of the relevant legislation pertaining to the conservation and responsible management of heritage resources.

Table 4-1: Applicable legislative context for the HRM process

Applicable legislation and guidelines used to compile the report	Reference where applied
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996 Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	The BA process and associated HRM process is being undertaken to identify heritage resources and determine heritage impacts associated with the Project. As part of the HRM process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) In terms of Section 43 of the MPRDA, the holder of a prospecting right, mining right, retention permit or mining permit remains responsible for any environmental liability, pollution or ecological degradation, and the management thereof, until the Minister has issued a closure certificate to the holder concerned. However, Kilbarchan Colliery was decommissioned in 1992, prior to the promulgation of the MPRDA. Thus, Eskom is not	The BA for the Project has been lodged with the DMR in October 2016. This HBAR, which relates specifically to the Project has been compiled in accordance with the MPRDA read with the EIA Regulations, 2014.

Applicable legislation and guidelines used to compile the report	Reference where applied
required to apply for a Closure Certificate in terms of GNR 527, Regulation 57 of the MPRDA but is compiling the Rehabilitation Plan to align with national legislative requirements and good practice.	
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) The NEMA, as amended was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	The BA process is being undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2014 Regulations, promulgated in terms of NEMA. These Listed Notices have been reviewed against the project activities to determine the likely triggers. The listed activities which are potentially triggered under the Listing Notices are provided in Table 2-4. Based on the activities listed, it has been identified that a BA process is required for the Project. An application for the listed activities will be submitted to the DMR who is the relevant Competent Authority in terms of this application for Environmental Authorisation.
GN R. 982: Environmental Impact Assessment Regulations, 2014 These three Listing Notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a BA process. ▪ Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process. ▪ Regulation GN R. 985 – Listing Notice 3: This	Refer to Table 2-4 above for the listed activities which could potentially be triggered by the Project.

Applicable legislation and guidelines used to compile the report	Reference where applied
notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: ■ 5. General principles for HRM ■ 6. Principles for management of heritage resources ■ 7. Heritage assessment criteria and grading ■ 38. Heritage resources management The Act requires that Heritage Resources Authorities (HRAs), in this case the South African Heritage Resources Agency (SAHRA) and Kwazulu-Natal Provincial Heritage Resources Authority, *Amafa aKwaZulu Natali* (Amafa), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.	A Needs and Desirability Application (NDA) will be submitted, as part of this HBAR, to the SAHRA and Amafa. The HBAR was compiled to comply with the following parts of subsection 3(3)(a) and (b) of the NHRA.
KwaZulu Natal Heritage Act, 2008 (Act no. 4 of 2008) (KZNHA) The KZNHA provides for the protection and management of heritage resources within KZN. These heritage resources take account of those under general protection and special protection, including: ■ General protection: ▪ Structures under Section 33; ▪ Graves of victims of conflict under Section 34; ▪ Traditional burial places under Section 35; and ▪ Battlefields, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites under Section 36.	A NDA will be submitted, as part of this HBAR, to the SAHRA and Amafa. The HBAR was compiled to comply with the following parts of subsection 3(3)(a) and (b) of the NHRA. The NDA was compiled to comply with the KZNHA and subsection 38(1) of the NHRA.

Applicable legislation and guidelines used to compile the report	Reference where applied
■ Special Protection: ▪ Heritage Landmark under Section38; ▪ Provincial Landmark under Section39; ▪ Graves of members of the Royal Family under Section 40; ▪ Battlefield sites, public monuments and memorials under Section 41; and ▪ Heritage Objects under Section 43. In terms of the KZNHA, a permit is required to carry out certain listed activities. To accomplish this, a NDA form must be completed for any proposed development. This form is submitted to Amafa for processing after which Amafa will issue comments for further heritage studies, if necessary.	
South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The guidelines provide the minimum standards that must be adhered to for the compilation of a Heritage Impact Assessment (HIA) Report. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: ■ Background information on the Project; ■ Background information on the cultural baseline; ■ Description of the properties or affected environs; ■ Description of identified sites or resources; ■ Recommended field rating of the identified sites to comply with Section 38 of the NHRA; ■ A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and ■ Recommendations for mitigation or management of identified heritage resources.	The HBAR was compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007)

5 Expertise of the specialists

Justin du Piesanie obtained his Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. Justin also attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. He currently holds the position of Heritage Management Consultant: Archaeologist at Digby Wells. He has over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation and grave relocation. Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, the Democratic Republic of Congo, Liberia and Mali on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage.

Justin is a professional and accredited CRM member of ASAPA (*Member No. 270*) and the ICOMOS South Africa (*Member No. 14274*).

Johan Nel is the manager of the HRM unit. He joined Digby Wells in June 2010 as an archaeologist and was subsequently made unit manager of the HRM unit in the Social Department. Johan holds an Honours degree in Archaeology from the University of Pretoria. He is a professional member of the Association of Southern African Archaeologists (ASAPA, No. 095), and accredited by the association's Cultural Resources Management (CRM) section. He is also a member of the International Council for Monuments and Sites (ICOMOS, No. 13839), an advisory body to the UNESCO World Heritage Convention. He has more than 16 years' experience in undertaking HRM projects, including archaeological mitigation and grave relocation. Johan has diverse international HRM experience in various African countries including Botswana, the Democratic Republic of Congo, Liberia, Sierra Leone and South Africa. This experience includes archaeological surveys, excavations, community consultation and grave relocations completed to IFC and other international standards. He has also acted as an expert reviewer of HRM projects undertaken in, amongst other countries, Malawi and Tanzania. Johan's present focus at Digby Wells is to develop the HRM unit into an integrated vehicle for assessing impacts on heritage resources through multidisciplinary approaches, following international HRM principles and standards.

6 Methodology

This chapter describes the various methodologies utilised in the assessment and compilation of this HBAR. Here, specific descriptions are provided for the following activities:

- Defining of the study areas;
- Data collection;
- Development of Cultural Significance (CS) and field ratings; and
- Impact assessment.

These are discussed separately below.

6.1 Defining study areas

As heritage resources do not exist in isolation from the wider natural, social, cultural and heritage landscape, assessment of potential impacts on heritage resources are complicated by the fact that diverse heritage impacts may manifest in different geographical areas and affect different communities.

Defined study areas are necessary to develop statements of CS, predict the types and intensity of impacts, and develop management plans. The general definition for a "study area" in terms of an impact assessment is the area most likely to experience impacts arising from, or to exert an influence on, the project or activity being assessed. For the purposes of this study, three 'concentric' study areas were defined to enable CS to be determined that informed the assessment of impacts and guided appropriate management measures. The proposed study areas are:

- **The regional study area** was defined as the district municipality. Where necessary, the regional study area was extended outside the boundaries of the district municipality to include much wider regional expressions of specific types of heritage resources and historical events (Plan 1).
- **The local study area** was defined as the area most likely to be influenced by any changes to heritage resources, or where project development could cause heritage impacts. This area was defined as the immediate surrounding properties / farms, as well as the affected local municipality (Plan 2).
- **The site-specific study area** was defined as the bounded project area i.e. the farm portions, within which the rehabilitation activities will be undertaken (Plan 3).

6.2 Data collection

Data collection was aimed at information gathering relating to known heritage resources within and surrounding the site-specific study area. Information was obtained from a variety of secondary sources such as academic journals, textbooks and records, national and provincial websites, archaeological field guides, national guidelines, maps, photographs and plans.

Individual data collection activities are described in more detail below.

6.2.1 Literature review

Published literature including academic papers, books and planning documents were collated and analysed to determine their relevance to this HBAR. Sources that were used to inform the findings are fully referenced under Section 12 below, and are briefly listed in Table 6-1 below.

Table 6-1: Relevant reviewed published sources

Palaeontology	■ Bamford, 2011 ■ Council for GeoScience, 2014 ■ Wilson & Anhaeusser, 1998
Stone Age	■ Deacon & Deacon, 1999 ■ Esterhuysen & Smith, 2007 ■ Korsman & Plug, 1994 ■ Plug, 1982 ■ Potgieter, 1955
Iron Age	■ African Farming Research Network, 2014 ■ Huffman, 2007 ■ Maggs, 1976 ■ Maggs, 2008 ■ Makhura, 2007
Historical and Colonial Period	■ Jooste, 2002 ■ South African History Online, 2014 ■ von der Heyde, 2013
Planning documents	■ Amajuba District Municipality, 2014
General	■ Mucina & Rutherford, 2006 ■ Statistics South Africa, 2011 ■ Winter & Baumann, 2005

Previously completed heritage studies that were conducted in the surrounding areas were reviewed to expand on the background information discussed. The findings provide evidence-based inferences to be made with regard to the potential for, and description of heritage resources that are likely to occur in the project region. Heritage cases and reports found to be relevant are listed in Table 6-2 below, and fully referenced under Section 12 below.

Table 6-2: Relevant reviewed heritage studies

Author	Report type	Area / property / project
Anderson, 2014	HIA	Leicester Sand Winning Operation
Tomose, 2013	HIA	Loskop Quarry

6.2.2 Database survey

A survey of the following repositories' databases was completed:

- National Automated Archival Information Retrieval System (NAAIRS);
- The Amafa Heritage Inventory Database;
- Statistics South Africa (Stats SA);
- South African Heritage Resources Information System (SAHRIS); and
- The University of the Witwatersrand (WITS) Archaeology Site Database.

Reviewed archival documents are summarised in Table 6-3 below.

Table 6-3: Reviewed archival documents

Depot	Source	Vol. no	Ref. no	Dates of documents
NAB	CSO	1043	1885/4742	1885-1886
NAB	CSO	1129	1887/1556	1887
SAB	NTS	9994	346/408D	1955-1959
SAB	NTS	10006	346/408E	1955-1956
SAB	NTS	10037	346/408M	1959-1960
SAB	NTS	10075	346/408Z	1959-1960

6.2.3 Historical layering

Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information System (GIS). The rationale behind historical layering is threefold, as it:

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

Cartographic sources referred to in this report are listed in Table 6-4.

Table 6-4: Cartographic sources relevant to the Project

Historical maps

Map series			Name / number		Date	
Natal Degree			Cadastral Sheet 14		1934	
Aerial photographs						
Job no.	**Flight plan**	**Photo no.**	**Map ref.**	**Area**	**Date**	**Reference**
66	006	16527	2729 2829	Newcastle/Dundee	1944	66/16527/1944
		16528			1944	66/16528/1944
672	009	01380	2729 2730 2829 2830 2831	Dundee	1970	672/01380/1970
		00434			1970	672/00434/1970
713	005	07306	2729 2730 2829 2830	Dundee	1973	713/07306/1973
		07305			1973	713/07305/1973
	006	07359			1973	713/07359/1973
956	005	01034	2729 2730	Newcastle	1991	956/01304/1991

6.3 Developing cultural significance and field ratings

6.3.1 Cultural significance

CS was determined based on identified resources' importance or contribution to four broad value categories: aesthetic, historical, scientific and social values. These categories summarises the CS and other values described in Section 3(3) of the NHRA. The resources' importance or contributions to these values were considered in terms of associative (qualitative) and / or rarity (quantitative) attributes. These attributes were based on the data collected and collated into the cultural heritage baseline profile presented in Section 8 below.

The integrity or condition of resources further influenced the CS. Integrity is largely determined based on resources' current, observed state of conservation, as well as notable changes made to it over the years.

6.3.2 Field Ratings

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

Field ratings considered the assigned CS and their importance in these contexts are determined based in part on the presence of other similar resources within the defined study areas described in Section 6.1 above. The ratings were determined by the average sum of assigned weighting against aesthetic, historic, scientific and social criteria.

6.4 Impact assessment

Impacts to heritage resources can be broadly divided into three categories – direct, indirect and cumulative. The assessments of these impacts are done by assigning a numerical value to the significance of the identified impacts.

6.4.1 Impact terminology

Sources of risk to heritage resources can, essentially, be divided into three broad categories, as follows:

- **Direct or primary effects** on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work.
- **Indirect, induced or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access.
- **Cumulative effects** on heritage resources result from in-combination effects on heritage resources acting with a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
  - **Additive**: the simple sum of all the effects, e.g. the total number of new buildings within a historical rural landscape.
  - **Synergistic**: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the visual effect of the increase of new buildings within a historical rural landscape.
  - **Time crowding**: frequent, repetitive impacts on a particular resource at the same time, e.g. the high rate of increase of new buildings within a historical rural landscape.
  - **Neutralizing**: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in patterns of cultivation could reduce the overall visual impact of additional new buildings within a historical rural landscape.
  - **Space crowding**: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

(adapted from Winter & Baumann, 2005: 36)

6.4.2 Assessment methodology

The assessment of impacts inherently considered the CS and field ratings. The consequence of the potential impact was weighted against parameters of intensity, spatial scale and duration. To identify the significance of the impact, the consequence was measured against the probability of the impact occurring.

The magnitude of the potential impact was applied to both pre- and post-mitigation scenarios with the aim of removing all negative impacts on heritage resources, and enhancing positive ones.

7 Constraints and limitations

Primary (i.e. field-based) data are based on a pre-disturbance survey completed by Digby Wells in October 2014 for a proposed long term active treatment option for mine affected water at Kilbarchan Colliery. No additional primary data collection was completed for the compilation of this HBAR in terms of the proposed Kilbarchan Colliery rehabilitation activities summarised in Table 2-4. Therefore, the site specific study area under assessment here has not been subject to primary data collection and the potential for unidentified heritage resources to occur within or in proximity to the area of development exists.

8 Cultural heritage baseline description

8.1 Geological context and palaeontology

This region of KwaZulu-Natal is underlain by lithostratigraphic units associated with the Karoo Supergroup (Main Karoo Basin), ranging in age from Late Carboniferous to Middle Jurassic (Plan 4). The bulk of the Karoo strata occur in the main basin, covering an area of approximately 700 000 km^2, which was much more extensive during the Permian Period. The Karoo Supergroup is famously known for its terrestrial vertebrate fossils, distinctive plant assemblages, thick glacial deposits and extensive dolerite dykes and sills (Johanson, et al., 2006).

The Karoo Supergroup comprises the Dwyka, Ecca and Beaufort Groups. Of relevance to this assessment is the Ecca Group, with the primary underlying stratigraphic unit being the *Vryheid Formation* deposited during the Permian era about 280 million years ago (mya). The *Vryheid Formation* consists of sandstone, shale, mudstone and coal (Wilson & Anhaeusser, 1998) occasionally interrupted by intrusive dolerite dykes of the Jurassic period.

The *Vryheid Formation* has a high potential to contain fossil heritage inclusive of Permian Glossopteris flora, diverse palynomorphs, rare insects and fossil woods, and non-marine bivalves. As a result the palaeontological sensitivity is rated very high (SAHRA, 2013a). Conversely, the Karoo Dolerite Suit is associated with dykes, sills and diatreme, with no fossil potential and is therefore not rated as palaeontologically sensitive (SAHRA, 2013b).

Table 8-1: Geological text and fossil heritage for the site specific study area

Eon	Era	Period	Ma	Lithographic Units			Significance	Fossils
				Supergroup	Group	Formation		
Phanerozoic	Mesozoic	Jurassic	145			Karoo dolerites	Negligible	None
Phanerozoic	Palaeozoic	Permian	300	Karoo	Ecca Group	Vryheid	Very high	Abundant plant fossils of Glossopteris and other plants. Trace fossils. The reptile Mesosaurus has been found in the southern part of the Karoo Basin. Rich fossil plant assemblages of the Permian Glossopteris Flora (lycopods, rare ferns and horsetails, abundant glossopterids, cordaitaleans, conifers, ginkgoaleans), rare fossil wood, diverse palynomorphs. Abundant, low diversity trace fossils, rare insects, possible conchostracans, non-marine bivalves, fish scales.

8.2 Stone Age

Broadly, the Stone Age is represented by lithic or stone tools produced by hominids, primarily of the genus *Homo*. In South Africa this Age is divided into three periods, name the Early (ESA), Middle (MSA) and Later Stone Age (LSA). The principle characteristics of these periods are briefly presented here.

Large hand axes and cleavers produced from coarse-grained material dominate the ESA assemblage, dated to between ± 2 million years ago (mya) - 250 000 year ago (kya) (Esterhuysen & Smith, 2007). The ESA is generally associated with the first *Homo* species (e.g. *H. habilis*), and possibly with some *Australopithecus* species.

The MSA dates from approximately 300 kya to 20 kya. Early MSA industries are characterised by high proportions of minimally modified blades, represented by the Levallois technique (Clark, 1982). The MSA is generally associated with archaic *H. sapiens* (e.g. *H. rhodesiensis*) through to early anatomically modern *H. sapiens sapiens.* In general the MSA can be broadly defined by the occurrence of blades and points produced from good quality raw material. (Deacon & Deacon, 1999). Within the area under consideration, it has been suggested that the intrusive dolerites discussed in Section 8.1 above, was often the sources for lithic production during the MSA (Wadley & Jacobs, 2006).

The LSA dates from approximately 40 kya to the historical period and is wholly associated with anatomically modern *H. sapiens sapiens*. Lithics associated with the LSA are specialised: specific tools being created for specific purposes, and the inclusion of bone tools into the assemblages (Mitchell, 2002). LSA sites commonly contain diagnostic artefacts, such as microlithic scrapers and segments. In a southern African context, the LSA is closely associated with hunter-gatherer groups, such as the San. Due to the nomadic

nature of LSA people, open sites are difficult to identify and usually poorly preserved. In addition to the production of LSA lithics, this period is characterised by evidence of ritual practises and complex societies, as well as rock art (Deacon & Deacon, 1999).

Within KwaZulu-Natal, identified Stone Age sites and *in situ* accumulations are predominantly associated with caves and shelters. Noteworthy sites include Sibudu Cave, iNkolimhashi Shelter and the Umhlatuzana Shelter (Badenhorst, 2003; Lombard, Wadley, Jacobs, Mohapi, & Roberts, 2010; Valladas, et al., 2005; Wadley & Jacobs, 2006). Within the site specific study, however, no lithic accumulations were identfiied in previously completed heritage assessments (Tomose, 2013; Anderson, 2014).

8.3 Farming community period

The Stone Age, in a southern African context, is followed by the Farming Community period, associated with various Bantu-speaking groups. Southern African Farming Community archaeology is further subdivided into two periods to distinguish between widespread events:

- Early Farming Communities (EFC) (200 CE – 1000 CE); and
- Late Farming Communities (LFC) (1000 CE – 1840 CE).

In the study area, Farming Community archaeology is limited to the LFC period. The most visible indicator of LFC settlements in the region are stonewalled settlements that have been categorised into two clusters, namely the *Moor Park* and *Ntsuanatstsi*. Within KwaZulu-Natal, stonewalled settlements are associated with the *Moor Park* cluster attributed to Nguni-speaking people. These settlements are characterised by the presence of low hut platforms which supported beehive huts in the residential area behind the cattle kraals dating between the 14th and 16th centuries (Huffman, 2007).

Within the local study area, two stonewalled settlements have been recorded (WITS, 2010), some 50 km to the south-west. No other Farming Community period sites or material culture were identified within the local or site specific study area through the data collection process. This may attributed to the natural environment, which may not have been conducive to herding or agricultural settlement as the biome contains poor grass cover and scattered shrubland pockets, and the dolerite dykes and sills may have resulted in clay soils and poor drainage (Mucina & Rutherford, 2006).

8.4 Colonial and historical period

The LFC is overlapped by the historical period in the regional study area. The historical period has traditionally been defined as contact between Europeans and indigenous peoples, generally considered to have occurred in the South African interior in the early to mid-19th century. However, this distinction is now considered artificial in many ways, and the current definition of the historical period includes the past 500 years (Swanepoel, Esterhuysen, & Bonner, 2008). This reinterpretation notwithstanding, this section considers

the historical landscape from around the beginning of the 19th century, as pre-European history is discussed earlier in terms of the LFC.

The town Newcastle, named after the Duke of Newcastle, was established in 1864 as the fourth town of the Natal Colony (Derwent, 2006). Originally, the town's economy was centred on the washing and spinning of wool produced from sheep farming (Amajuba District Municipality, 2014).

Fort Amiel was built in 1879 and used during the Transvaal War of 1880 – 1881 (i.e. First Anglo Boer War) by British forces. The war erupted in 1880 in Potchefstroom as a result of the Boers refusing to succumb to British rule while the British tried to expand their territory. Within the area under consideration, several skirmishes and battles took place during this period (First South African War 1880-1881 , 2014).

Notable battles within the region included:

- Battle of Laing's Nek on 28 January 1881;
- Battle of Ingogo on 8 February 1881; and
- Battle of Majuba on 27 February 1881.

The Battle of Majuba (Government Gazette 2843, 1941) is located approximately 40 km north from the site specific study area. This was the site of a battle between the Boers, under the command of Commander General Piet Joubert, and the British troops, led by General Sir George Pomeroy Colley. The battle took place on 27 February 1881 where British troops were defeated and their General was killed. As a result of the battle, peace terms were negotiated in O'Neil's Cottage near the site of the battlefield (Government Gazette 3066, 1942).

In the year the war ended, coal was discovered in the area around Newcastle and by 1885, there is evidence for coal mining activities on the farm Kilbarchan and surrounding areas. According to the National Archives of South Africa (NASA), in 1885 an individual by the name of T. C. Adendorff offered to assist the Natal Government to test the coal fields. Records indicate that in 1887 there is correspondence from the Manager of the Kilbarchan Coal Mines. With the start of industrialisation with coal mining in this area, infrastructure requirements were eminent. The railways and first trains reached Newcastle in 1890 (Amajuba District Municipality, 2014), and by 1900, the imperial map clearly shows an established road and rail route with a station at Kilbarchan, known as Ingagane Station.

From the historical imagery, it is evident that during the 1940's the site specific study area is dominated by agrarian activities. This changes during the 1950's with the establishment of the Kilbarchan Colliery in 1952. Reviewed documents as summarised in Table 6-3, dating to 1955 pertain to the employee's quarters, the hospital, the school and the overall plans for the Kilbarchan Colliery. Subsequent to this, the construction of Ingagane Power Station commenced in 1959 and by 1963 construction was complete (Leech, 2003).

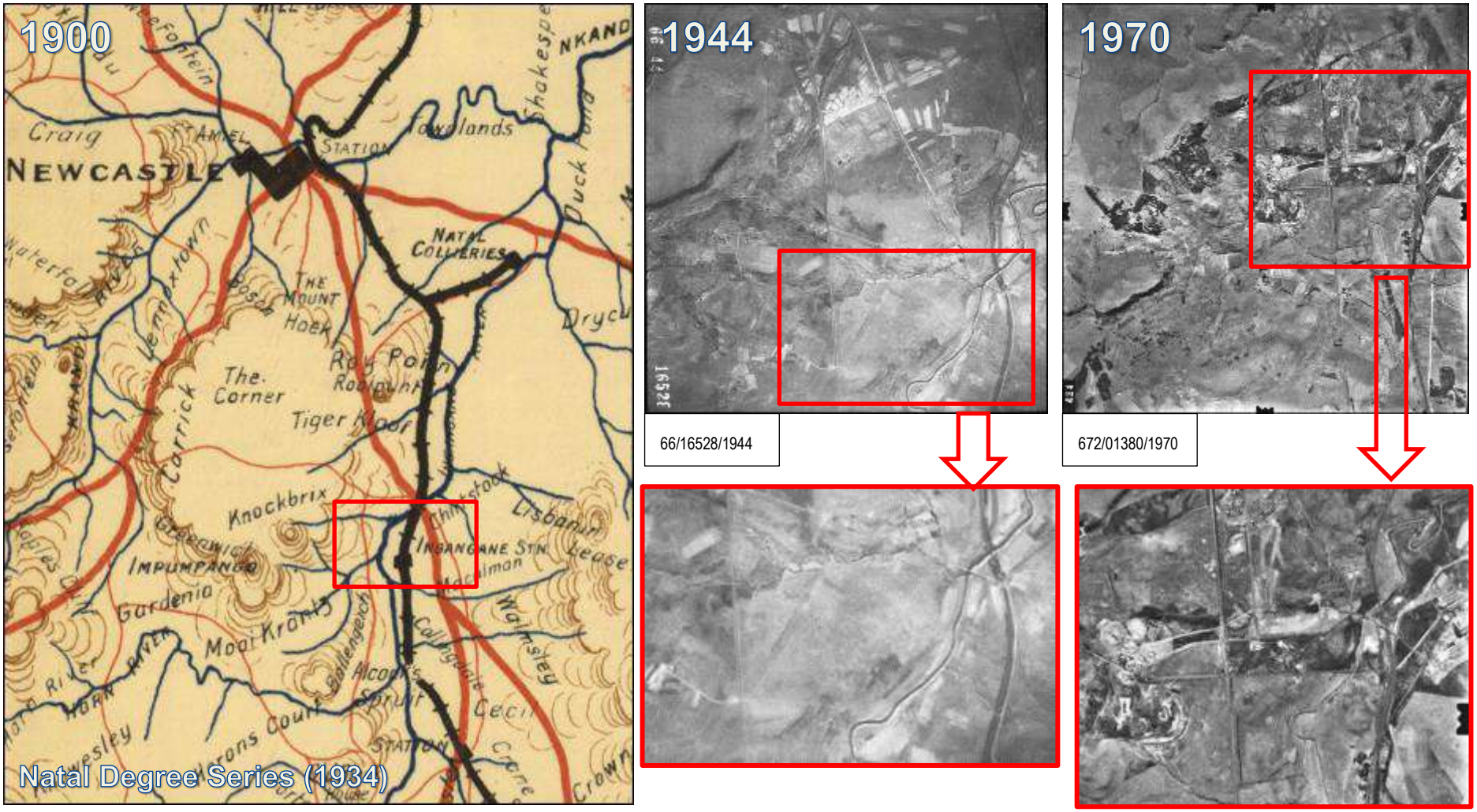

Figure 8-1: Historical cartographic and aerial imagery of the site specific study area (approximate extent of project area in red)

8.5 Identified heritage resources

Within local study area, specifically the town of Newcastle and Charlestown, the following provincial heritage sites (Grade II) were identified:

Table 8-2: Identified Provincial Heritage Sites[4]

Site Name	
Town Hall, Scott Street	Old State School, Albert Street
Old Carnegie Library, Voortrekker Street	Old Court House, Holland Street
Old Magazine, Scott Street	Majuba Battlefield
Fort Amiel	Majuba Battlefield Conservation Area
Buffalo River Bridge	O'Niell's Cottage
Old Residency, 96 Allen Street	St Dominic's Academy Pavilion, St. Dominics Street
Hildrop House, Hilldrop Road	Kliphius, 64 Voortrekker Street

A pre-disturbance survey[5] was undertaken for the Kilbarchan Colliery Water Decanting Project on the Kilbarchan Colliery in October 2014 along the medium term solution pipeline routing alternative option 2[6]. The survey was undertaken as a non-intrusive pedestrian survey and identified heritage resources were recorded as waypoints using handheld GPS, photographs and detailed notes.

Five heritage resources were identified within the site specific study area (Plan 5). These are summarised in Table 8-3:

Table 8-3: Previously identified heritage resources

Site ID	Type	Co-ordinates	
St/001	LFC / Historical	-27.849006	29.968375
A stonewalled site measuring 300 m along the length of a ridge. Approximately 4 clusters of stonewalls were identified with			

[4] Listed Grade II sites sources from the Amafa Heritage Inventory Database.

[5] The pre-disturbance survey did not cover the extent of the proposed activities under consideration in this assessment.

[6] The medium term solution pipeline routing alternative option 2 does not form part of this BA Process, and will be assessed during the environmental authorisation process for the proposed active treatment options at a later stage.

two graves within the site, recorded separately as BGG/01a (*-27.849079 29.967226*) and BGG/01b (*-27.849308 29.966034*). One grave was surrounded by a stonewall and had aloes (*A. maculata*) growing on the grave. A power line is located in proximity to the site.

Figure 8-2: Stone walling Ste/001 and grave BGG/001a

Site ID	Type	Co-ordinates	
St/002	Historical	-27.852983	29.964705
A stonewalled structure and a possible grave was identified adjacent a modern homestead.			

Figure 8-3: Stone wall Ste/002 and possible grave

Site ID	Type	Co-ordinates	
BGG/003	Historical	-27.846571	29.971541
Burial ground measuring approximately 800 m x 500 m. The burial ground has been in use since 1978. Approximately 100 graves are located within the cemetery.			

Figure 8-4: Cemetery BGG/003

Site ID	Type	Co-ordinates	
Ste/004	Historical	-27.844005	29.975158
Declared Provincial Site (Grade II) in accordance with Section 39 of the KZNHA. Historical sandstone bridge (Buffalo River Bridge) dating from approximately 1900. The bridge supports had been constructed from large sandstone blocks with iron beams running across the bridge and corrugated iron as the walls of the bridge. The plaque that would have usually depicted the date of the bridge had been removed.			

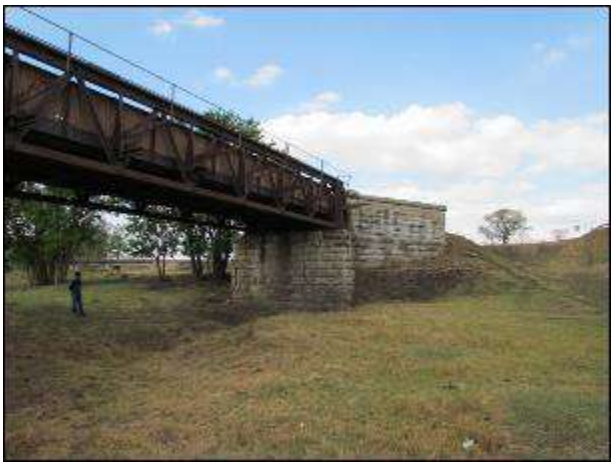

Figure 8-5: Historical sandstone bridge Ste/004

Site ID	Type	Co-ordinates
BGG/005	Historical	TBC
Burial ground identified adjacent to the border of Open Pit area 2. Total number of graves and GPS position are to be confirmed.		

The burial ground comprises of several stone packed graves.
 **Figure 8-6: Burial ground BGG/005**

9 Heritage impact assessment

9.1 Cultural significance and field rating

The CS and field rating assessment considered the criteria and methodology described in Section 6.3 above. It was determined that the identified heritage resources have a CS ranging from negligible to very high (Table 9-1). Heritage resources with a negligible CS, in line with the SAHRA minimum standards, have been sufficiently recorded and no further mitigation is required. As such, St/002 is not considered further in this HBAR.

Table 9-1: Cultural significance of identified heritage resources within the site specific study area

Resource ID	Type	CS	CS Motivation	Field Rating
BGG/001a	Burial / grave	Very High	Burial grounds and graves can be assessed their social criteria. In this instance, the significance of burial grounds and graves can be universally accepted and the integrity of the site remains high.	General Protection IV A
BGG/001b				
BGG/003				
BGG/005				
Ste/004	Structure	Medium High	The structure was assessed against aesthetic, historic, scientific and social criteria. It was determined that the bridge displays characteristics that are rare and unique for the time period it was constructed, and is of importance to the history of the country. The structures integrity and	Grade II

Resource ID	Type	CS	CS Motivation	Field Rating
			fabric is well preserved, and the inherent meaning is evident. The structure is listed as a Provincial Heritage Site and therefore has a Field Rating of Grade II.	
St/001	Site	Medium	The site was considered against historic, scientific and social criteria. It was determined that the site exhibits characteristics that are common and well represented throughout diverse landscape, but may have special meaning to certain communities. The site also contains burial grounds and graves, of which the significance can be universally accepted.	General Protection IV B
St/002	Site	Negligible	The site was considered against historic, scientific and social criteria. It was determined that the site exhibits characteristics that are common and well represented throughout diverse landscape, but may have special meaning to certain communities. While the meaning of the site is evident, the potential for information from the site is questionable.	General Protection IV C

The identified burial grounds and graves were considered against social criteria. The identified burial grounds and graves were determined to have a very high CS in accordance with their universally accepted significance as defined in the adopted methodology. In addition to the assessment against the prescribed criteria, the integrity of burial grounds and graves are deemed to be high as the fabric is well preserved and meaning is well established.

The historic bridge Ste/004 was assessed against all the prescribed criteria. Against aesthetic and historic criteria, sandstone bridges dating to this period are generally rare and uncommon, and contribute to an understanding of the development of the railway throughout South Africa, and role these networks played during the various wars and industrialisation of the interior. Considering scientific and social criteria, the sandstone bridges dating to the early 20th century are uncommon and may hold some importance to specific scientific communities. Based on these motivations, in conjunction with well-preserved fabric and meaning well established, the structure was assigned a CS of medium-high. Additionally, the structure is listed as a Provincial Heritage Site (Grade II) on the Amafa Heritage Inventory Database.

Finally, St/001 was considered against historic, scientific and social criteria and determined to have a medium CS. The reasoning for this designation is based on the conclusion that

while attributes can be considered against these criteria, the site displays characteristics that are common and well represented throughout diverse landscapes. The site does, however, contain burial grounds and graves, therefore the social criteria is higher and will have specific associations with certain communities.

9.2 Impact assessment

No impacts to the identified heritage resources summarised in Table 8-3 are envisaged for the activities under consideration in this BA Process. The assumption is based on the following:

- Rehabilitation of the discard dump that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources;
- Rehabilitation of the Open Pit area 1C and 2 that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources;
- Rehabilitation of the east and west landfill sites that has previously altered the landscape and reduced the potential for *in situ* heritage resources, or impacts to heritage resources;
- The establishment of the phytoremediation plantation in an area that has previously been altered through agrarian and other anthropogenic activities thereby reduced the potential for *in situ* heritage resources, or impacts to heritage resources.

These activities are not considered further in this assessment.

9.3 Unplanned events and low risk

Risks are defined as the potential consequence(s) of an interaction combined with its likelihood. Should a risk eventuate, it will manifest as an impact. These concepts are often misconstrued and lead to disproportionate amounts of effort spent on assessing minor risks with potentially insignificant impacts, at the cost of overlooking more important ones.

Broad mitigation and monitoring measures were provided for low risks and unplanned events were not assessed in detail (i.e., with significance ratings). In general monitoring is an accepted form of mitigation for low risks.

Certain project activities may represent low risks to heritage resources or cause unplanned events. Low risks, where identified, can be monitored to gauge if the baseline changes and mitigation is required. Unplanned events are events that can occur on any project and cannot be monitored, but can, however, be planned for to reduce the severity of potential impacts if and where they occur.

Based on the proposed project activities, potential unplanned events and the associated impacts and management measures have been identified and summarised in Table 9-2.

Table 9-2: Low risks and unplanned events

Low Risk / Unplanned Event	Potential Impact	Mitigation / Management / Monitoring
Rehabilitation of Open Pit area 2	Potential damage to burial ground BGG/005 during rehabilitation activities	A Conservation Management Plan (CMP) must be developed for implementation during rehabilitation activities. This may include, but not limited to the following: ▪ BGG/005 must be clearly demarcated and a minimum 25 m buffer be maintained during rehabilitation activities. ▪ Access to the burial ground may not be restricted. ▪ BGG/05 must be monitored on a monthly basis during rehabilitation activities.
Accidental exposure of heritage resources generally protected under Section 36 of the KZNHA and 35 of the NHRA	Damage to and / or destruction of previously unidentified heritage resources.	Project specific Chance Find Protocols (CFPs) must be developed for rehabilitation activities associated with the Kilbarchan Colliery. The CFPs must clearly describe the type of heritage resources that may occur within the site specific study area, the protocol to follow in the event of accidental exposure of previously unidentified heritage resources, and the appropriate management measures and reporting structures to be adhered to. The CFP at a minimum should include the following: ■ Definitions as defined by Chapter 1 of the KZNHA, Section 2 and 38(1) of the NHRA; ■ Procedures that detail the following: ▪ How to spot a chance find; ▪ Steps to be undertaken when a chance find is made; ▪ Internal reporting structures; ▪ Recording of chance finds; and ▪ Legal processes and requirements.
Accidental exposure of heritage resources generally protected under Section 34 and 35 of the KZNHA, and 36 of the NHRA		

10 Recommendations

Based on our understanding of the cultural landscape as presented under Section 8 above, potential impacts to heritage resources against the listed activities summarised in Table 2-4 will be negligible. The following recommendations are made to be considered as conditions for approval of the BA process.

10.1 Palaeontology

Although the site specific area is underlain by the *Vryheid Formation*, which has a high sensitivity rating, the proposed activities will not impact on the formation.

It is therefore recommended that any conditions exclude a Palaeontological Impact Assessment (PIA).

10.2 Burial grounds and graves

All burial grounds and graves located on the Kilbarchan Colliery properties are to be conserved *in situ* on condition that detailed Conservation Management Plans (CMP) are developed and approved by the relevant HRAs.

10.3 General recommendations

In general, the above recommendations should be considered on condition that a detailed project-specific Chance Finds Protocol (CFP) is developed and approved that must be integrated in the EMP.

The purpose of the CFP must be to define procedures that aim to minimise damage and destruction to any heritage resources that may be accidentally exposed during project activities.

The CFP must clearly describe the type of heritage resources that may occur within the site specific study area, the protocol to follow in the event of accidental exposure of previously unidentified heritage resources, and the appropriate management measures and reporting structures to be adhered to. The CFP at a minimum should include the following:

- Definitions as defined by Chapter 1 of the KZNHA, Section 2 and 38(1) of the NHRA;
- Procedures that detail the following:
  - How to spot a chance find;
  - Steps to be undertaken when a chance find is made;
  - Internal reporting structures;
  - Recording of chance finds; and
  - Legal processes and requirements.

11 Conclusion

Digby Wells was requested by Eskom to undertake a BA process for rehabilitation activities at the Kilbarchan Colliery. This report assessed the potential heritage impacts to known heritage resources by the project activities summarised in Table 2-4, and provided specialist recommendations under Section 10 above.

Where the proposed recommendations are adopted as conditions for approval, Digby Wells is of the opinion that project related activities will have a negligible impact to identified heritage resources and the cultural landscape as defined under Section 8 above.

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Appendix A: Specialist CV

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Heritage Management Consultant: Archaeologist

Social Sciences Department

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
08/2011 to present	Digby Wells Environmental	Heritage Management Consultant: Archaeologist

Period	Company	Title/position
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Professional Affiliations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A

5 Publications

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

6 Experience

I have 5 years experiences in the field of heritage resources management (HRM) including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. During my studies I was involved in academic research projects associated with the Stone Age, Iron Age, and Rock Art. These are summarised below:

- Wits Fieldschool - Excavation at Meyersdal, Klipriviersberg Johannesburg (Late Iron Age Settlement).
- Wits Fieldschool - Phase 1 Survey of Prentjiesberg in Ugie / Maclear area, Eastern Cape.
- Wits Fieldschool – Excavation at Kudu Kopje, Mapungubwe National Park Limpopo Province.

- Wits Fieldschool – Excavation of Weipe 508 (2229 AB 508) on farm Weipe, Limpopo Province.
- Survey at Meyerdal, Klipriviersberg Johannesburg.
- Mapping of Rock Art Engravings at Klipbak 1 & 2, Kalahari.
- Survey at Sonop Mines, Windsorton Northern Cape (Vaal Archaeological Research Unit).
- Excavation of Kudu Kopje, Mapungubwe National Park Limpopo Province.
- Excavation of KK (2229 AD 110), VK (2229 AD 109), VK2 (2229 AD 108) & Weipe 508 (2229 AB 508) (Origins of Mapungubwe Project)
- Phase 1 Survey of farms Venetia, Hamilton, Den Staat and Little Muck, Limpopo Province (Origins of Mapungubwe Project)
- Excavation of Canteen Kopje Stone Age site, Barkley West, Northern Cape
- Excavation of Khami Period site AB32 (2229 AB 32), Den Staat Farm, Limpopo Province

Since 2011 I have been actively involved in environmental management throughout Africa, focusing on heritage assessments incompliance with International Finance Corporation (IFC) Performance Standards and other World Bank Standards and Equator Principles. This exposure to environmental, and specifically heritage management has allowed me to work to international best practice standards in accordance with international conservation bodies such as UNESCO and ICOMOS. In addition, I have also been involved in the collection of quantitative data for a Relocation Action Plan (RAP) in Burkina Faso. The exposure to this aspect of environmental management has afforded me the opportunity to understand the significance of integration of various studies in the assessment of heritage resources and recommendations for feasible mitigation measures. I have work throughout South Africa, as well as Burkina Faso, the Democratic Republic of Congo, Liberia and Mali.

7 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005 2006	Survey of residential development in Meyersdal. This included the recording of identified stone walled settlements through detailed mapping and photographs. Included was the Phase 2 Mitigation of two stone walled settlements	Archaeological Impact Assessments	Researcher, Archaeological Assistant	2 Months		Completed survey, excavations and reporting	Archaeological Resource Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006 2006	Recording of an identified Late Iron Age stonewalled settlement through detailed mapping	Mapping	Archaeological Assistant, Mapper	1 Month	Sun City	Completed mapping	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007 2007	Archaeological survey for proposed residential development at the Witbank dam	Archaeological Impact Assessment	Archaeological Assistant	1 Week		Completed Archaeological Impact Assessment report	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008 2008	Archaeological survey and basic assessment of Modderfontein Holdings	Archaeological Impact Assessment	Archaeologist	1 Month		Completed the assessment of 13 properties	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008 2008	Heritage Assessment for expansion of mining area at Rhino Mines	Heritage Impact Assessment	Archaeologist	2 Weeks	Rhino Mines	Completed the assessment	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008 2008	Archaeological survey of Moddergat 389 KQ, Schilpadnest 385 KQ, and Swartkop 369 KQ,	Archaeological Impact Assessment	Archaeologist	1 Weeks	Cronimet	Completed field survey and reporting	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008 2008	Heritage Statement defining the cultural landscape of the Limpopo Province to assist in establishing sensitive receptors for the Eskom Thohoyadou SEA Project	Heritage Statement	Archaeologist	2 Months	Eskom	Completed Heritage Statement	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009 2009	Contracted by the Heritage Contracts Unit to help facilitate the Phase 2 excavations of a Late Iron Age / historical site identified in Shoshanguve	Excavation and Mapping	Archaeologist	1 Week	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009 2009	Mapping of a Late Iron Age rock shelter being studied by the Archaeology Department of the University of the Witwatersrand	Mapping	Archaeologist	1 Day	University of the Witwatersrand	Completed mapping of the shelter	University of the Witwatersrand Karim Sadr karim.sadr@wits.ac.za
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010 2010	Heritage Survey of the Anglo-Boer War Vaalkrans Battlefield where the servitude of the NMP pipeline	Heritage Impact Assessment	Archaeologist	1 Week	Umlando Consultants	Completed survey	Umlando Consultants Gavin Anderson umlando@gmail.com
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010 2010	Heritage survey of Witpoortjie 254 IQ, Mindale Ext 7 and Nooitgedacht 534 IQ for residential development project	Archaeological Impact Assessment	Archaeologist	1 Week	ARM	Completed survey for the AIA	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010 2010	Phase 2 archaeological excavations of Late Iron Age Site	Archaeological Excavation	Archaeologist	2 Weeks	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
De Brochen and Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010 2010	Mapping of archaeological sites 23, 26, 27, 28a & b on the Anglo Platinum Mines De Brochen and Booysendal	Mapping	Archaeologist	1 Week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010 2010	Desktop study to identify heritage sensitivity of the Limpopo Province	Desktop Study	Archaeologist	1 Month	Strategic Environmental Focus	Completed Report	Strategic Environmental Focus (SEF) Vici Napier vici@sefsa.co.za
Batlhako Mine Expansion	North-West Province, South Africa	2010 2010	Mapping of historical sites located within the Batlhako Mine Expansion Area	Mapping	Archaeologist	1 Week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011 2013	Implementation of the Grave Relocation Project for the Randgold Kibali Gold Project	Grave Relocation	Archaeologist	2 Years	Randgold Resources	Successful relocation of approximately 3000 graves	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012 2014	Assessment of 7 proposed hydro-power stations along the Kibali River	ESIA	Heritage Consultant	2 Years	Randgold Resources	Completed Heritage Impact Assessment	Randgold Resources Charles Wells Charles.wells@randgoldreources.com
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012 2012	Heritage Impact Assessment on the farm Vygenhoek	EIA and EMP	Heritage Consultant	6 Months	Aquarius Resources	Completed Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012 2012	Heritage impact Assessment for the proposed TSF and Pipeline of Geluksdal Mine	EIA and EMP	Heritage Consultant	4 Months	Gold One International	Completed Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012 2012	Survey for Burial Grounds and Graves	Burial Grounds and Graves Management Plan	Heritage Consultant	4 Months	Platreef Resources	Project closed by client due to safety risks	Platreef Resources Gerick Mouton

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012 2012	Archaeological Excavation of identified sites	Archaeological Excavation	Heritage Consultant	4 Months	Resources Generation	Completed excavation and reporting, destruction permits approved	Resources Generation Louise Nicolai
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012 2012	Watching brief for construction of new road	Watching Brief	Heritage Consultant	1 Week	Bokoni Platinum Mine	Completed watching brief, reviewed report	Bokoni Platinum Mines (Pty) Ltd
SEGA Gold Mining Project	Burkina Faso	2012 2013	Socio Economic and Asset Survey	RAP	Social Consultant	3 Months	Cluff Gold PLC	Completed field survey and data collection	Cluff Gold PLC
SEGA Gold Mining Project	Burkina Faso	2013 2013	Specialist Review of Heritage Impact Assessment	Reviewer	Heritage Consultant	1 Week	Cluff Gold PLC	Reviewed specialist report and made appropriate recommendations	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013 2013	Heritage Impact Assessment for the proposed Consbrey and Harwar Collieries	EIA and EMP	Heritage Consultant	2 Months	Msobo	Completed Heritage Impact Assessments	Msobo
New Liberty Gold Project	Liberia	2013 2014	Implementation of the Grave Relocation Project for the New Liberty Gold Project	Grave Relocation	Heritage Consultant	5 Months	Aureus Mining	Grave Relocation completed	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013 2013	Heritage Scoping for the proposed Falea Uranium Mine	Environmental Assessment	Heritage Consultant	2 Months	Rockgate Capital	Completed scoping report and recommended further studies	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013 2014	Heritage impact Assessment for the proposed Putu Iron Ore Mine, road extension and railway line	EIA and EMP	Heritage Consultant	6 Months	Atkins Limited	Completed Heritage Impact Assessment and provided recommendations for further studies	Atkins Limited Irene Bopp Irene.Bopp@atkinsglobal.com

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013 2014	Notification of intent to Develop and Heritage Statement for the Sasol Twistdraai Expansion	NID	Heritage Consultant	2 Months	ERM Southern Africa	Completed NID and Heritage Statement	ERM Southern Africa Alan Cochran Alan.Cochran@erm.com
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013 2013	Project Management of the heritage study	NID	Project Manager	3 Months	ERM Southern Africa	Project completed	ERM Southern Africa Kasantha Moodley Kasantha.Moodley@erm.com
Exxaro Belfast, Paardeplaats and Eerstelingsfontein GRP	Belfast, Mpumalanga, South Africa	2013 2014	Grave Relocation Plan for the Belfast, Paardeplaats and Eerstelingsfontein Projects	GRP	Project Manager, Heritage Consultant	2 Years	Exxaro	Burial Grounds and Graves consultation complete and applications to authorities submitted for permitting	Exxaro Johan van der Bijl Johan.vanderbijl@exxaro.com
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014 2014	Social consultation for the Relocation Action Plan component of the Nzoro 2 Hydro Power Station	RAP	Social Consultant	2 Months	Randgold Resources	Completed introductory meetings – project has been placed on hold	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for the proposed new sludge storage facility and pipeline	EIA and EMP	Heritage Consultant	2 Months	AECOM	Completed HIA and submitted to the authorities	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for reclamation activities associated with the Soweto Cluster Dumps	EIA and EMP	Heritage Consultant	3 Months	ERGO	Completed HIA and submitted to the authorities	ERGO Greg Ovens greg.ovens@drdgold.com
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the Section 102 Amendment of the Klipspruit Mine EMP	EIA and EMP	Heritage Consultant	6 Months	BHP Billiton	HIA finalised and submitted to the authorities	BHP Billiton

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the expansion of the Klipspruit Mine	EIA and EMP	Heritage Consultant	6 Months	BHP Billiton	HIA finalised and submitted to authorities	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014 2014	NID and Heritage Statement for the construction of the Rondebult Pipeline	BA	Heritage Consultant	1 Week	ERGO	Completed screening assessment and NID	ERGO Greg Ovens greg.ovens@drdgold.com
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014 2014	Update of the Kibali ESIA for the inclusion of new open-cast pit areas	ESIA	Heritage Consultant	1 Month	Randgold Resources	Completed heritage assessment and input into the ESIA	Randgold Resources Charles Wells Charles.wells@randgoldresources.com
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014 2014	Gap analysis for the EMP consolidation of operations west of Johannesburg	Gap Analysis	Heritage Consultant	1 Month	Gold One International	Gap analysis complete and proposed way forward submitted	Gold One International
Yzermite PIA	Wakkerstroom, Mpumalanga, South Africa	2014 2014	Palaeontological Assessment for the Yzermyne Project	PIA	Project Management	1 Month	EcoPartners	Completed report and submitted to authorities	EcoPartners San Oosthuizen san@ecopartners.co.za
Sasol Mooikraal Basic Assessment	Sasolburg, Free State, South Africa	2014 2014	Heritage Basic Assessment for the proposed Mooikraal Pipeline	HBA	Heritage Consultant	4 Months	Sasol Mining	Completed Heritage Basic Assessment and submitted to the authorities	
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012 2015	EIA and EMP for the Aquarius Everest North Mining Project	EIA and EMP	Project Manager	1 Year	Aquarius Resources	EIA and EMP amended and submitted to authorities. Authorisation received.	Aquarius Resources Robyn Mellett Robyn.Mellett@aquariussa.co.za
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014 2015	Heritage impact Assessment for the Oakleaf Project	EIA and EMP	Heritage Consultant	4 Months	Oakleaf Investment Holdings	HIA report finalised and submitted to the authorities	

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Rea Vaya Phase II C Project	Johannesburg, Gauteng, South Africa	2014 2014	Heritage Impact Assessment on 2 structures along Rea Vaya Routing	HIA	Project Manager	1 year	Iliso Consulting	HIA report finalised and submitted to the authorities	Iliso Consulting
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014 2015	Review of Heritage Impact Assessment for the NTEM ESIA	EIA and EMP	Specialist Reviewer	1 Month	International Mining and Infrastructure Corporation plc	Specialist reports reviewed and comments provided	
Imvula Project	Kriel, Mpumalanga, South Africa	2014 2015	Heritage Scoping Report for Imvula EIA	EIA and EMP	Heritage Consultant	1 Year 4 Months	Ixia Coal	Project completed and submitted	
Sibanye WRTRP	Gauteng, South Africa	2014 2016	Heritage Impact Assessment for the Sibanye WRTRP	EIA and EMP	Heritage Consultant	On-going	Sibanye	Project is on-going	
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014 2015	Heritage Impact Assessment for the Vanadium Project	EIA and EMP	Heritage Consultant	1 Year	VM Investment Company	HIA report finalised and submitted to the authorities	
NLGM Constructed Wetlands Project	Liberia	2015 2015	Heritage Assessment for the proposed constructed wetlands	HIA	Heritage Consultant	1 Month	Aureus Mining	HIA report finalised and submitted	
ERPM Section 34 Destruction Permits Applications	Johannesburg, Gauteng, South Africa	2015 2015	Section 34 Destruction Permit Applications for the SEV and Cason Shafts	HIA and S.34 Applications	Project Manager	4 Months	Ergo Mining	Application submitted and permits received	Ergo Mining Greg Ovens greg.ovens@drdgold.com
JMEP II EIA	Botswana	2015 2015	Heritage Impact Assessment for the JMEP II Wellfields	HIA	Heritage Consultant	2 Months	Jindal	HIA completed and submitted to authorities	
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015 2016	Heritage Impact Assessment and Section 34 Destruction Permit Application	HIA and S. 34 Applications	Project Manager	On-going	Bigen Africa Services (Pty) Ltd	Project is on-going	Bigen Africa Services (Pty) Ltd Kamantha Veerasamy Kamantha.Veerasamy@bigenafrica.com
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015 2016	Heritage Impact Assessment and Section 34 Permit Application	HIA and S. 34 Applications	Project Manager	On-going	Bigen Africa Services (Pty) Ltd	Project is on-going	Bigen Africa Services (Pty) Ltd Taka Sande Taka.Sande@bigenafrica.com

Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015 2016	Heritage Impact Assessment	EIA and EMP	Heritage Consultant	On-going	Namane Resources (Pty) Ltd	Project is on-going	
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015 2016	Heritage Impact Assessment	EIA and EMP	Heritage Consultant	On-going	Namane Resources (Pty) Ltd	Project is on-going	

Mr Johan Nel

Unit manager: Heritage Resources Management

Social Sciences

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2014	Integrated Heritage Resources Management Certificate, NQF Level 6	Rhodes University
2002	BA (Honours) (Archaeology)	University of Pretoria
2001	BA	University of Pretoria
1997	Matric with exemption	Brandwag Hoërskool

2 Language Skills

Language	Speaking	Writing	Reading
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

3 Employment

Period	Company	Title/position
2009/2011 to present	Digby Wells Environmental	Manager: Heritage Resources Management unit
2005/2010-2011	Digby Wells Environmental	Archaeologist
2010/2005-2005/2010	Archaic Heritage Project Management	Manager and co-owner
2003-2007		Freelance archaeologist

	Rock Art Mapping Project	Resident archaeologist
2002-2003	Department of Anatomy, University of Pretoria	Special assistant: Anthropology
2001-2002	Department of Anatomy, University of Pretoria	Technical assistant
1999-2001	National Cultural History Museum & Department of Anthropology and Archaeology, UP	Assistant: Mapungubwe Project

4 Experience

Johan Nel has 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 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, Liberia and Sierra Leone. I am fluent in English and Afrikaans, with excellent writing and research skills.

5 Project Experience

5.1 Archaeological Surveys and Impact Assessments

2003-2004. Freelance consulting archaeologist. Roodt & Roodt CC. RSA. Archaeological surveys. Specialist.

2004-2005. Resident archaeologist Rock Art Mapping Project. University of KwaZulu-Natal. Kwazulu-Natal, RSA. Rock art mapping & recording. Specialist.

5.2 Archaeological Mitigation

2007. Archaeological investigation of Old Johannesburg Fort. Johannesburg Development Agency. Gauteng, RSA. Archaeological mitigation. Project manager.

2008. Final consolidated report: Watching Brief on Soutpansberg Road Site for the new Head Offices of the Department of Foreign Affairs, Pretoria Gauteng. Imbumba-Aganang D & C Joint Venture. Gauteng, RSA. Watching Brief. Project manager.

2011. Sessenge archaeological site mitigation. Randgold Resources. Doko, DRC. Archaeological mitigation. Specialist.

2011. Mitigation of three sites, Koidu Kimberlite Project. Koidu Holdings SA. Koidu, Sierra Leone. Archaeological mitigation. Project manager.

2012. Boikarabelo Phase 2 Mitigation of Archaeological Sites. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.

2012. Additional Archaeology Mitigation of Sites. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.

2013. Archaeological Excavations of Old Well, Rhodes University, Grahamstown. Rhodes University. Eastern Cape, RSA. Archaeological mitigation. Specialist.

2014. Archaeological Site Destruction. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Archaeological permitting and mitigation. Project manager.

5.3 Heritage Impact Assessments

2005. Final consolidated Heritage Impact Assessment report: Proposed development of high-cost housing and filling station, Portion of the farm Mooiplaats 147 JT. Go-Enviroscience. Mpumalanga, RSA. Heritage Impact Assessment. Project manager.

2006. Final report: Heritage resources Scoping survey and preliminary assessment for the Transnet Freight Line EIA, Eastern Cape and Northern Cape. ERM Southern Africa (Pty) Ltd. Northern & Eastern Cape, RSA. Heritage Scoping Assessment. Project manager.

2007. Proposed road upgrade of existing, and construction of new roads in Burgersfort, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.

2007. Recommendation of Exemption: Above-ground SASOL fuel storage tanks located at grain silos in localities in the Eastern Free State. Sasol Group Services (Pty) Ltd. Free State, RSA. Letter of Exemption. Project manager.

2008. Summary report: Old dump on premises of the new Head Offices, Department of Foreign Affairs, Pretoria, Gauteng. Imbumba-Aganang D & C Joint Venture. Gauteng, RSA. Archaeological Impact Assessment. Project manager.

2008. Van Reenen Eco-Agri Development Project. Go-Enviroscience. Kwazulu-Natal & Free State, RSA. Heritage Impact Assessment. Project manager.

2008. Heritage Impact Assessment for proposed water pipeline routes, Mogalakwena District, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.

2008. Phase 1 Heritage and Archaeological Impact Assessment: Proposed establishment of an access road between Sapekoe Drive and Koedoe Street, Erf 3366 (Extension 22) and the Remainder of Erf 430 (Extension 4). AGES South Africa (Polokwane). Limpopo, RSA. Heritage Impact Assessment. Project manager.

2008. Heritage resources scoping survey and preliminary assessment: Proposed establishment of township on Portion 28 of the farm Kennedy's Vale 362 KT, Steelpoort, Limpopo Province. AGES South Africa (Polokwane). Limpopo, RSA. Heritage Scoping Assessment. Project manager.

2008. Randwater Vlakfontein-Mamelodi water pipeline survey. Archaeology Africa CC. Gauteng, RSA. Heritage Impact Assessment. Specialist.

2010. Heritage Impact Assessment for conversion of PR to MRA. Georock Environmental. Northwest, RSA. Heritage Impact Assessment. Project manager.

2010. Temo Coal Project. Namane Commodities (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2011. Marapong Treatment Works. Ceenex (Pty) Ltd. Limpopo, RSA. Archaeological Impact Assessment. Project manager.

2011. Complete Environmental Authorisation. Rhodium Reefs Ltd. Limpopo, RSA. Archaeological Impact Assessment. Specialist.

2011. Big 5 PV Solar Plants. Orlight (Pty) Ltd. Western and Northern Cape, RSA. Heritage Impact Assessment. Specialist.

2011. Heritage Impact Assessment for Koidu Diamond Mine. Koidu Holdings SA. Koidu, Sierra Leone. Heritage Impact Assessment. Specialist.

2012. TSF and Pipeline. Gold One. Gauteng, RSA. Heritage Impact Assessment. Project manager.

2012. Kangra Coal Heritage Screening Assessment. ERM Southern Africa (Pty) Ltd. Mpumalanga, RSA. Heritage Screening Assessment. Project manager.

2012. Environmental and Social Studies. Platreef Resources (Pty) Ltd. Limpopo, RSA. Heritage specialist advice. Project manager.

2012. ESKOM Powerline EIA. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Project manager.

2012. Falea Project ESIA. Denison Mines Corp. (Rockgate Capital Corp). Falea, Mali. Heritage Impact Assessment. Specialist.

2012. EIA for Proposed Emergency Measures to Pump and Treat. AECOM SA (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Specialist.

2012. Tonguma Baseline Studies. Koidu Holdings SA. Tonguma, Sierra Leone. Heritage Impact Assessment. Specialist.

2012. Vedanta IPP. Black Mountain Mining (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2012. Boikarabelo Railway Realignment. Ledjadja Coal (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2012. Platreef ESIA. Platreef Resources (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2012. Roodekop EIA. Universal Coal Development 4 (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.

2012. Kangala HIA. Universal Coal Development 1 (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment and permitting. Specialist.

2012. Roodepoort Strengthening. Eskom Holdings SOC Ltd. Gauteng, RSA. Notification of Intent to Develop. Specialist.

2012. Trichardtsfontein EIA / EMP. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2012. Zandbaken EIA/EMPR. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2013. ATCOM Tweefontein NID. Jones & Wagener (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2013. Roodepoort Heritage Impact Assessment. Fourth Element Consulting (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Project manager.

2013. JHB BRT Phase 2 Heritage Impact Assessment. Iliso Consulting (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Project manager.

2013. Kangra Coal HIA. ERM Southern Africa (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Project manager.

2013. Slypsteen Bulk Sample Application. Summer Season Trading (Pty) Limited. Northern Cape, RSA. Heritage Impact Assessment. Project manager.

2013. Kempton Park Heritage Statement and NID. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.

2013. Sasol Twistdraai CFD. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.

2013. HRS & NID - River Crossings Upgrade. Iliso Consulting (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Project manager.

2013. Waterberg Prospecting Right Applications. Platinum Group Metals (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Project manager.

2013. Landau Waste Licence Application. Anglo Operations (Pty) Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.

2013. Prospecting Right Consultation Report. Rustenburg Platinum Mines Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.

2013. Witrand Prospecting EMP. Rustenburg Platinum Mines Limited. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.

2013. EMP Amendment for CST. Copper Sunset Trading (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.

2013. Maseve IFC ESHIA. Maseve Investment (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Reviewer / specialist.

2013. Dalyshope ESIA. Anglo Operations (Pty) Limited. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2013. Klipfontein Opencast Project. Bokoni Platinum Mines (Pty) Ltd. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2013. Consbrey and Harwar MPRDA EIA/EMP. Msobo Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.

2013. Slypsteen 102 EMP Amendment. Summer Season Trading (Pty) Limited. Northern Cape, RSA. Heritage Impact Assessment. Specialist.

2013. Putu Iron Ore ESIA. Atkins Limited Incorporated. Putu, Liberia. Heritage Impact Assessment. Specialist.

2013. Ash backfilling at Sigma Colliery. Sasol Mining (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Specialist.

2013. Syferfontein Block 4 - Underground Coal Mining for Sasol. Sasol Mining (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.

2013. Prospecting Right Amendment to Include Bulk Sampling. Sikhuliso Resources (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.

2013. Nooitgedacht EIA, EMP Amendment & Gap Analysis. Xstrata Coal South Africa. Limpopo, RSA. Heritage Impact Assessment. Specialist.

2014. Gold One EMP Consolidation Phase 0. Gold One. Gauteng, RSA. Heritage Impact Assessment. Reviewer / specialist.

2014. Kilbarchan Audit and EIA. Eskom Holdings SOC Ltd. Kwazulu-Natal, RSA. Heritage Impact Assessment. Reviewer / specialist.

2014. Klipspruit Extension Environmental Assessment. BHP Billiton Energy Coal South Africa Limited. Mpumalanga, RSA. Heritage Impact Assessment. Reviewer / specialist.

2014. Klipspruit South BECSA EIA. BHP Billiton Energy Coal South Africa Limited. Mpumalanga, RSA. Heritage Impact Assessment. Reviewer / specialist.

2014. EIA/EMP Soweto Cluster. DRD GOLD ERGO (Ergo Mining (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Reviewer / specialist.

2014. London Road Heritage Statement. ERM Southern Africa (Pty) Ltd. Gauteng, RSA. Notification of Intent to Develop. Reviewer / specialist.

2014. Grootegeluk MPRDA, NEMA and IWULA. Exxaro Coal (Pty) Ltd. Limpopo, RSA. Notification of Intent to Develop. Reviewer / specialist.

2014. Kibali ESIA & EMP Update. Randgold Resources. Doko, DRC. Heritage Impact Assessment. Specialist.

2014. Nokuhle Colliery NEMA Process. HCI Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.

2014. HRM Process for Hendrina Wet Ashing. Lidwala Consulting Engineers (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.

2014. Weltevreden NEMA. Northern Coal (Pty) Ltd. Mpumalanga, RSA. Heritage Impact Assessment. Specialist.

2014. Sasol Sigma Mooikraal Pipeline BA. Sasol Mining (Pty) Ltd. Mpumalanga, RSA. Notification of Intent to Develop. Specialist.

5.4 Burial Grounds and Graves Consultation and Relocation

2005. Report on exhumation, relocation and re-internment of 49 graves on Portion 10 of the farm Tygervallei 334 JR, Kungwini Municipality, Gauteng D Georgiades East Farm (Pty) Ltd. Gauteng, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2005. Southstock Collieries Grave Relocation. Doves Funerals, Witbank. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2005. Social consultation for Smoky Hills Platinum Mine Grave Relocation. PGS (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.

2005. Social consultation for Elawini Lifestyle Estate Grave Relocation. PGS (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.

2006. Social consultation for Zonkezizwe Grave Relocation. PGS (Pty) Ltd. Gauteng, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.

2006. Social consultation for Motaganeng Residential Development Grave Relocation. PGS (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.

2006. Social consultation for Zondagskraal Coal Mine Grave (Pty) Ltd. Mpumalanga, RSA. Stakeholder consultation on burial grounds and graves. Social consultant.

2007. Exploratory excavation of an unknown cemetery at Du Preezhoek, Fountains Valley, Portion 383 of the farm Elandspoort 357 JR, Pretoria, Gauteng. Bombela Civil Joint Venture. Gauteng, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2007. Final consolidated report: Phase 2 test excavations ascertaining the existence of alleged mass graves, Tlhabane West, Extension 2, Rustenburg, Northwest Province. Bigen Africa Consulting Engineers. Northwest, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2007. Repatriation of Mapungubwe Human Remains. Department of Environmental Affairs and Tourism. Limpopo, RSA. Repatriation. Project manager.

2008. Report on skeletal material found at Pier 30, R21 Jones Street off-ramp, Kempton Park. Bombela Civil Joint Venture. Gauteng, RSA. Heritage Scoping Assessment. Project manager.

2011. Kibali Grave Relocation. Randgold Resources. Doko, DRC. International grave relocation. Specialist.

2012. Platreef Platinum Mine Burial Grounds and Graves Census. Platreef Resources (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Project manager.

2013. New Liberty Grave Relocation Process. Aureus Mining Inc. Kinjor, Liberia. International grave relocation. Project manager.

2013. Bokoni Burial Grounds and Grave Census and Grave Relocation Plan. Bokoni Platinum Mines (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Project manager.

2014. Arnot Colliery Grave Relocation Project. Exxaro Coal (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Project manager.

2014. Paardeplaats and Belfast RAPs. Exxaro Coal (Pty) Ltd. Mpumalanga, RSA. Burial grounds and graves consultation, permitting and relocation. Reviewer / specialist.

2014. Thabametsi EIA, EMP, IWULA, IWWMP and PPP. Exxaro Coal (Pty) Ltd. Limpopo, RSA. Stakeholder consultation on burial grounds and graves. Specialist.

5.5 Research Reports and Reviews

2007. Research report on cultural symbols. Ministry of Intelligence Services. RSA. Research report. Project manager.

2007. Research report on the remains of kings Mampuru I and Nyabela. National Department of Arts and Culture. RSA. Research report. Project manager.

2012. Baseline Scoping and Pre-feasibility Songwe Rare Earth Element Project. Mkango Resources Limited. Songwe, Malawi. Heritage Impact Assessment. Reviewer / specialist.

2013. Fatal Flaw Analysis and EIA Process for AMD Man in Eastern Basin. AECOM SA (Pty) Ltd. Gauteng, RSA. Heritage Impact Assessment. Reviewer / specialist.

6 Professional Registration

Position	Professional Body	Registration Number
Council member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	095
Member	International Association of Impact Assessors (IAIA)	N/A
Member	International Council on Monuments and Sites (ICOMOS)	13839
Member	Society for Africanist Archaeologists (SAfA)	N/A

7 Publications

Authors and Year	Title	Published in/presented at
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 the 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	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.
Nel, J. 2013.	The Matrix: A proposed method to evaluate significance of, and change to, heritage resources.	Paper presented at the 2013 ASAPA Biennial conference: Gaborone, Botswana.
Nel, J. 2013	HRM and EMS: Uncomfortable fit or separate process.	. Paper presented at the 2013 ASAPA Biennial conference:

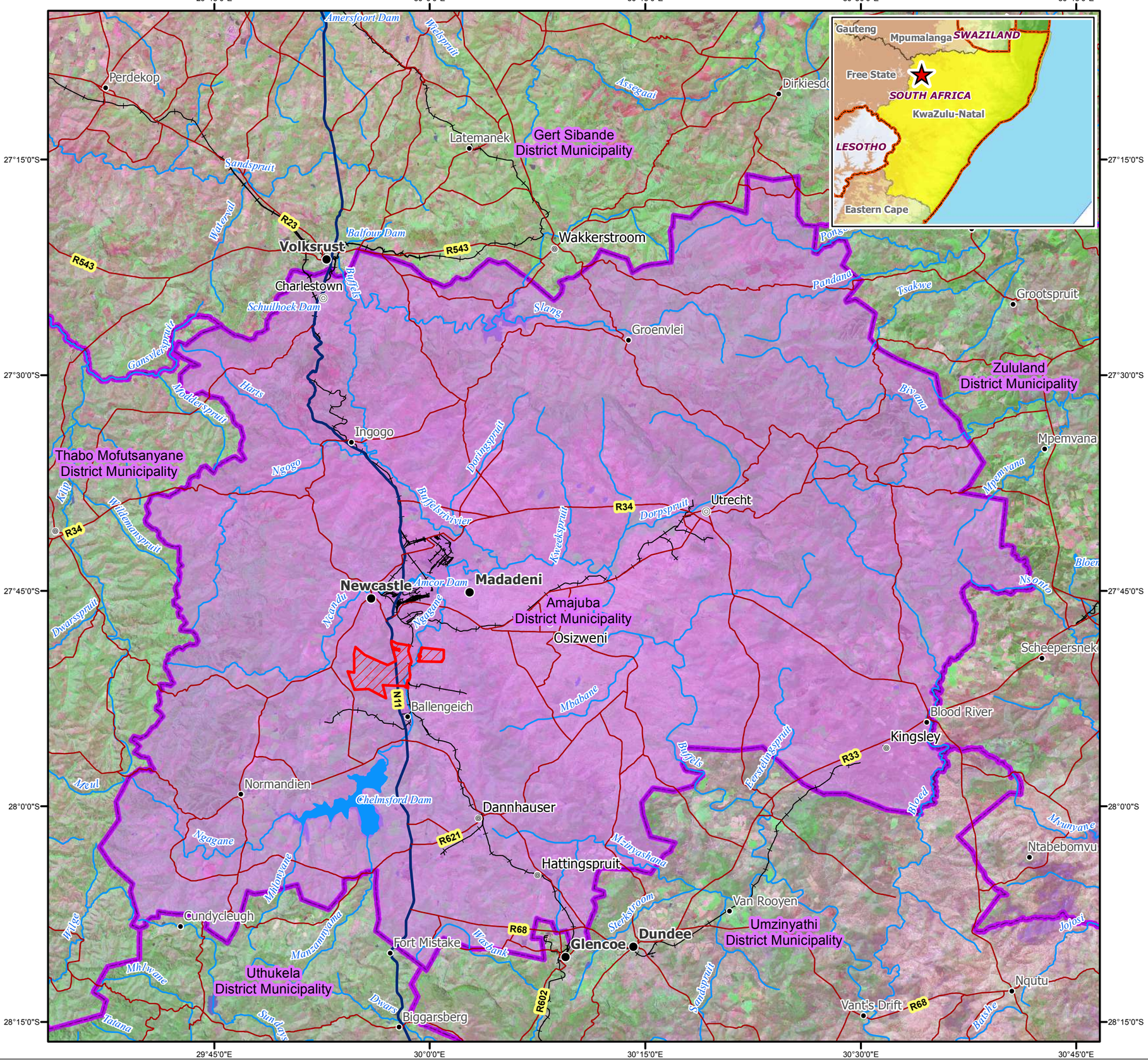
Gaborone, Botswana.

Appendix B: Plans

Plan 1

Eskom Kilbarchan Colliery

Regional Setting



Legend

- Mining Licence Boundary
- Major Town
- Secondary Town
- Other Town
- Settlement
- Main Road
- National Road
- Railway Line
- River
- Dam
- Affected District Municipality
- District Municipal Boundary

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Projection: Transverse Mercator	Ref #: jcf.ESK3520.201604.066
Datum: WGS84	Revision Number: 1
Central Meridian: 29°E	Date: 05/04/2016

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Kilometres

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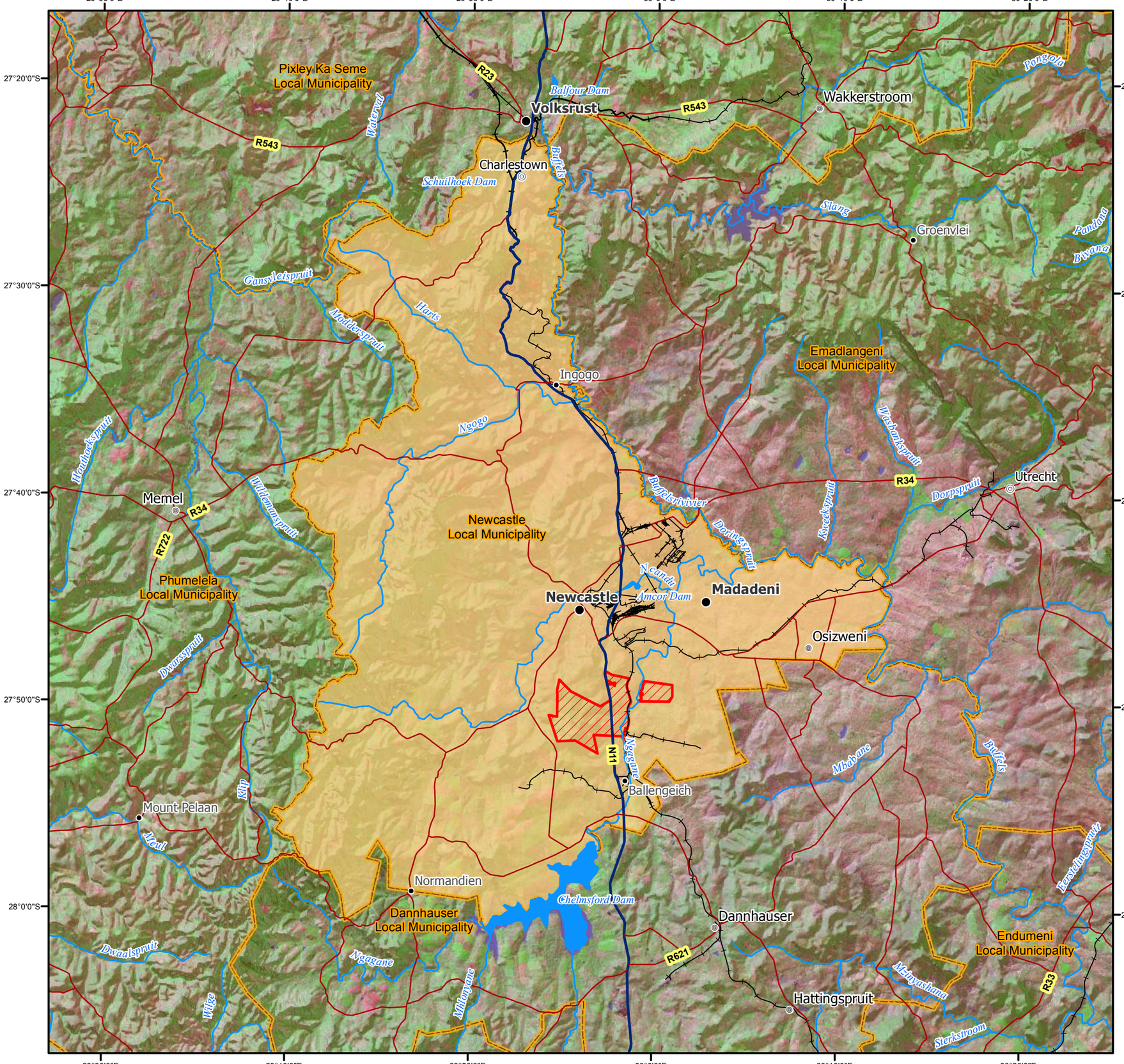
Plan 2

Eskom Kilbarchan Colliery

Local Setting



Legend

- Mining Licence Boundary
- Major Town
- Secondary Town
- Other Town
- Settlement
- Main Road
- National Road
- Railway Line
- River
- Dam
- Affected Local Municipality
- Local Municipal Boundary

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Central Meridian: 29°E

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Revision Number: 1
Date: 05/04/2016

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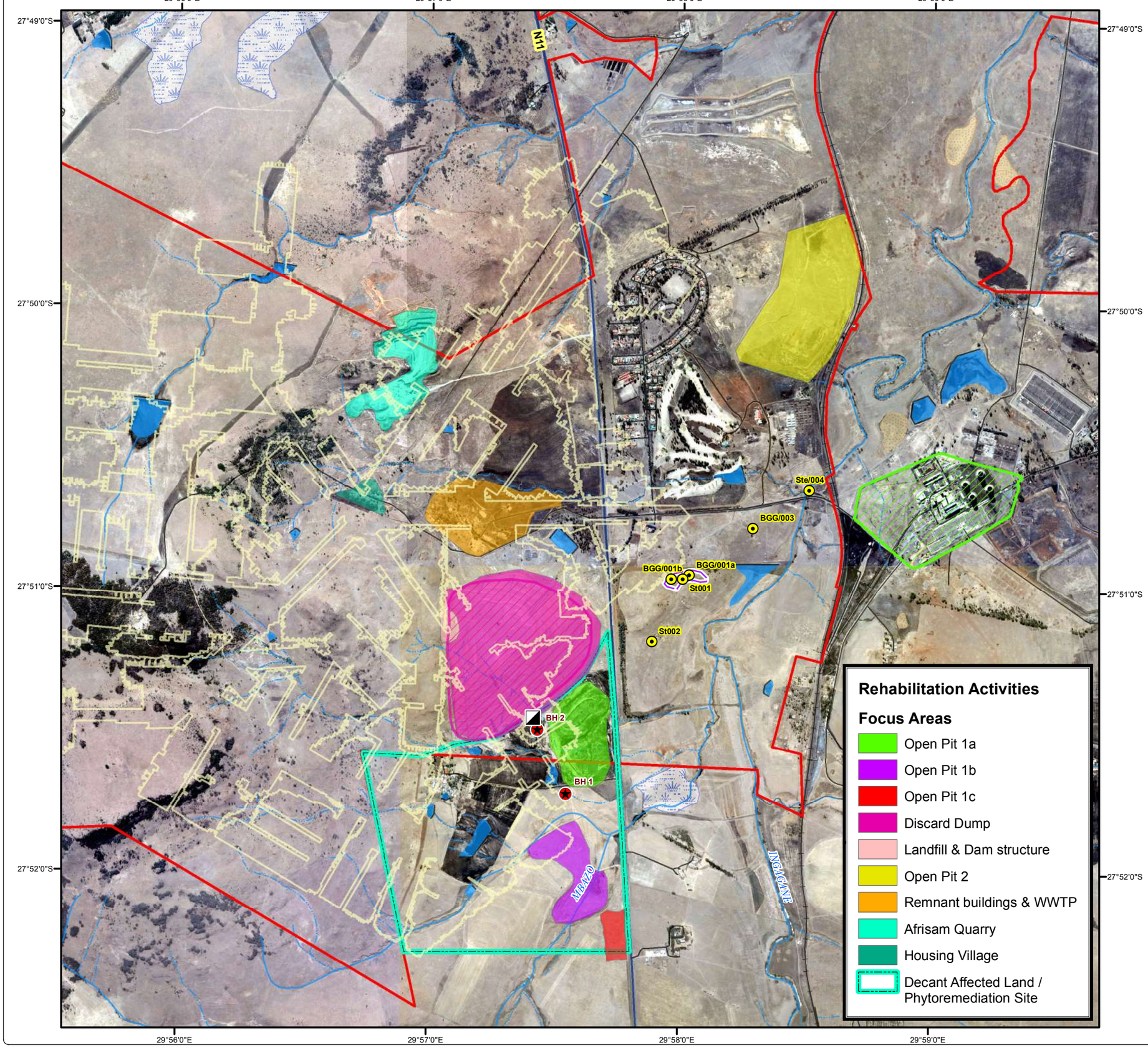
Plan 3

Eskom Kilbarchan Colliery

Mine Layout and Rehabilitation Activities



Legend

- Mining Licence Boundary
- Heritage Point
- Power Line
- Arterial Route
- Minor Road
- Railway Line
- Dam Wall
- Perennial Stream
- Non - Perennial Stream
- Dam / Lake
- Perennial Pan
- Non - Perennial Pan
- Wetland
- Heritage Area

Infrastructure

- Bioremediation Plant

Infrastructure

- Decant Boreholes
- Discard Dump
- Powerstation

Historical Mine Plan

- Underground Mining Area

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Revision Number: 1
Date: 23/08/2016

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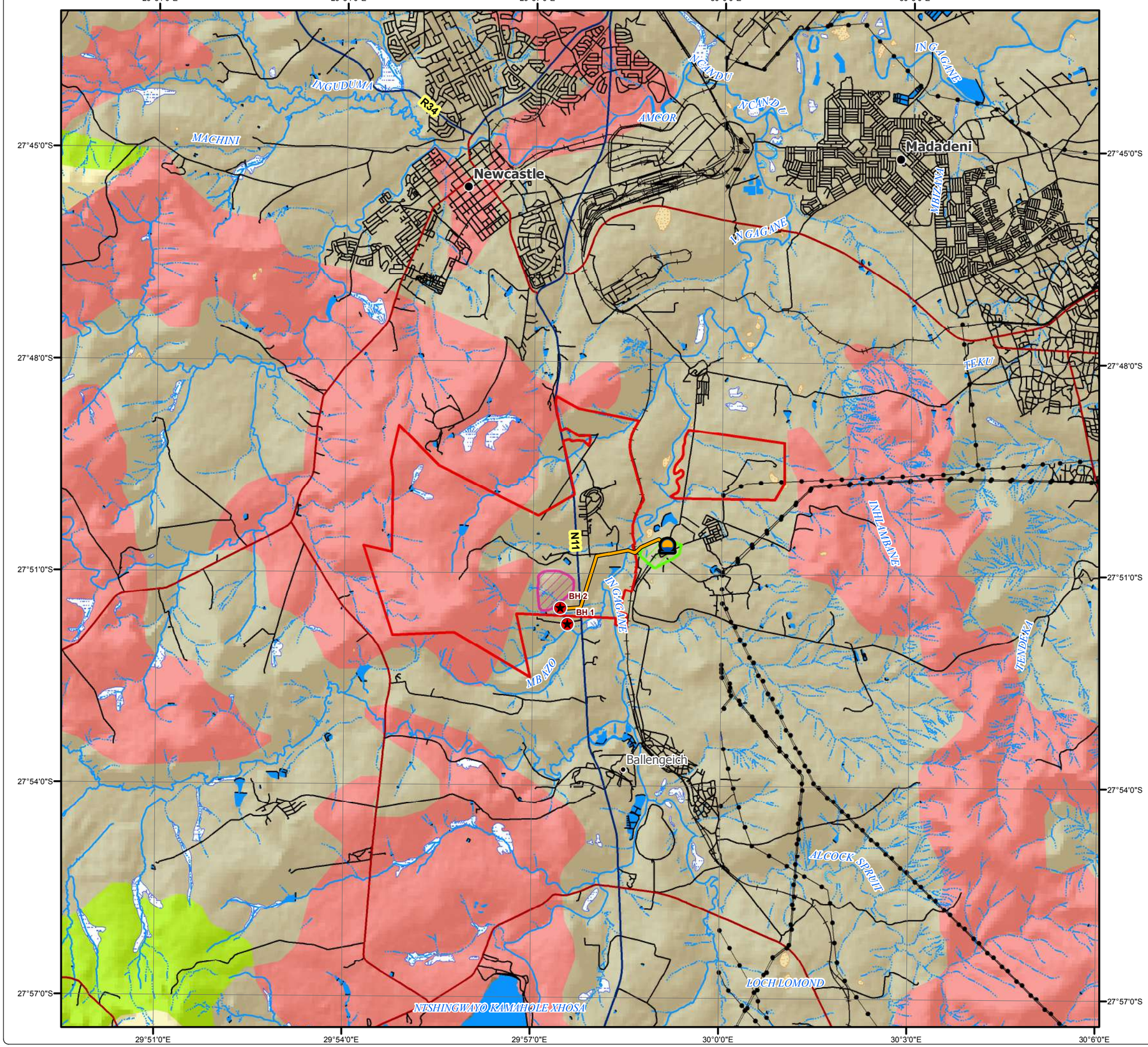
Plan 4

Eskom Kilbarchan Colliery

Regional Geology



Legend

- Kilbarchan Project Area
- Major Town
- Settlement
- Power Line
- Railway Line
- Arterial / National Route
- Main Road
- Minor Road
- Dam Wall
- Perennial Stream
- Non Perennial Stream
- Dam / Lake
- Perennial Pan
- Non - Perennial Pan
- Wetland

Regional Geology

- Karoo Dolerite Sui
- Adelaide Sbgrp, Beaufort Grp
- Volksrust Fm, Ecca Grp
- Vryheid Fm, Karoo Spgrp

Infrastructure

- Decant Boreholes
- Discard Dump
- Powerstation

Proposed Active Treatment Option

- Desalination and Brine Return Plant
- Medium Term Solution Pipeline Alternative Route 2

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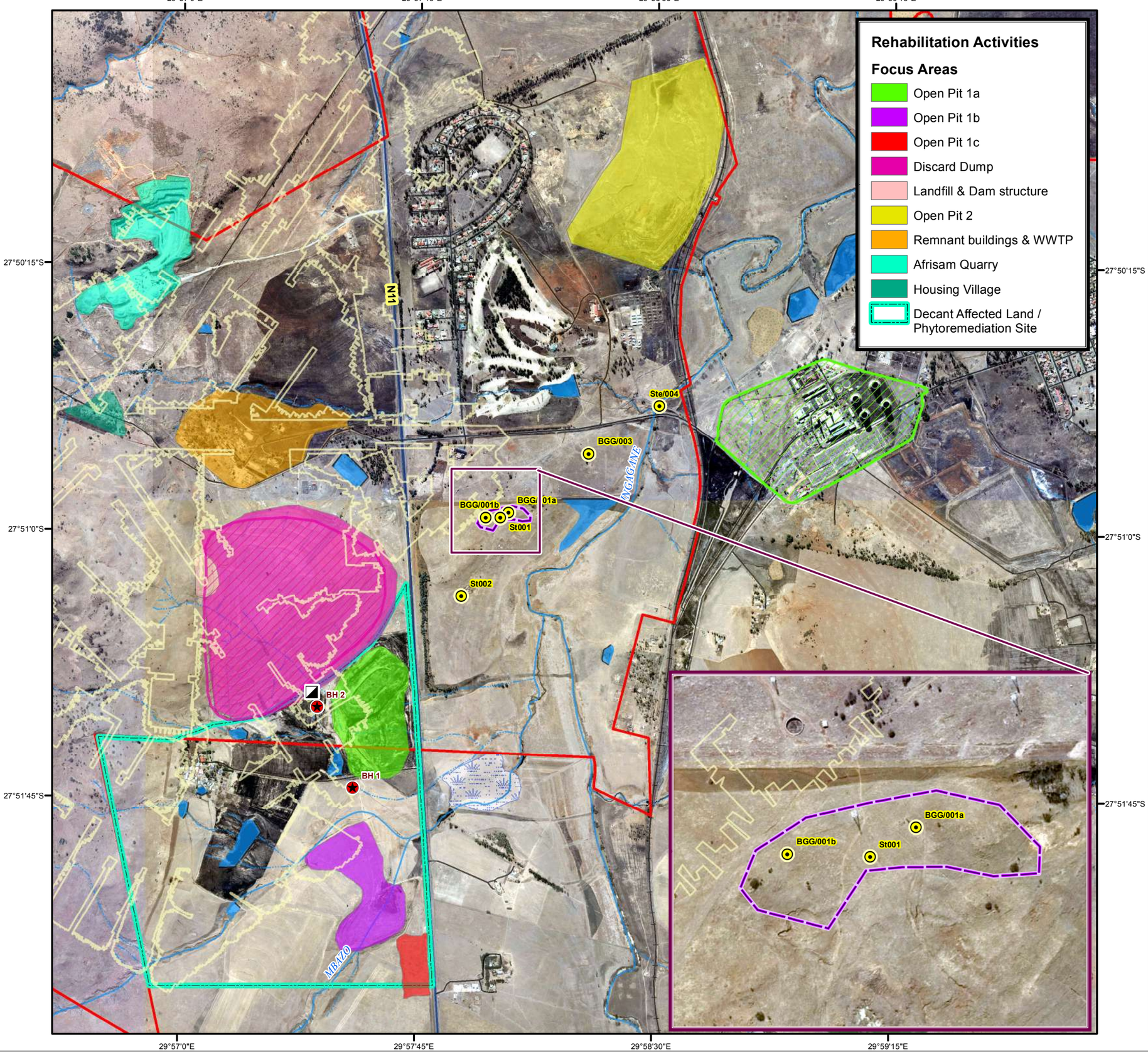
Plan 5

Eskom Kilbarchan Colliery

Identified Heritage Resources



Legend

- Mining Licence Boundary
- Power Line
- Arterial Route
- Minor Road
- Railway Line
- Dam Wall
- Perennial Stream
- Non - Perennial Stream
- Dam / Lake
- Non - Perennial Pan
- Wetland

Infrastructure

- Decant Boreholes
- Bioremediation Plant
- Discard Dump
- Powerstation

Historical Mine Plan

- Underground Mining Area

Heritage Resources

- Heritage Point
- Heritage Area

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Revision Number: 1
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Plan 6

Eskom Kilbarchan Colliery

Regional Setting

1:10 000

Legend

- Mining Licence Boundary
- Settlement
- Power Line
- Arterial / National Route
- Main Road
- Minor Road
- Railway Line
- Dam Wall
- Perennial Stream
- Non - Perennial Stream
- Dam / Lake
- Non - Perennial Pan
- Wetland

Infrastructure

- Decant Boreholes
- Bioremediation Plant
- Discard Dump
- Powerstation

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Central Meridian: 29°E

Ref #: jcf.ESK3520.201604.100
Revision Number: 1
Date: 13/04/2016

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