TETRA4 (PTY) LTD – CLUSTER 1 - PROPOSED FIRST PHASE GAS PRODUCTION FROM 12 HISTORIC WELLS

HERITAGE STUDY: SCOPING LEVEL REPORT

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ENVIRONMENTAL IMPACT MANAGEMENT SERVICES (PTY) LTD

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i. The results of the project;
ii. The technology described in any report; and,
iii. The recommendations delivered to the Client.

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DECLARATION OF INDEPENDENCE AND SUMMARY OF EXPERTISE

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Environmental Impact Management Services. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process.

HERITAGE CONSULTANT: PGS Heritage

CONTACT PERSON: Polke Birkholtz

SIGNATURE:

Polke D. Birkholtz has been actively involved in the heritage industry since 1997 during which time he has completed in excess of 270 heritage and archaeological projects across South Africa. He is well versed in the applicable legislation as it relates to heritage in South Africa.

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EXECUTIVE SUMMARY

PGS Heritage was appointed by Environmental Impact Management Services (EIMS) to undertake a Heritage Scoping Report for the proposed Cluster 1 project by Tetra4 (Pty) Ltd. The study area is located between Welkom and Theunissen, Matjhabeng and Masilonjana Local Municipalities, Lejweleputswa District Municipality, Free State Province.

The purpose of the Heritage Scoping report is to identify at a desktop level what the probability is of heritage resources being identified in the study area. This is important because heritage resources are protected in terms of the National Heritage Resources Act, No 25 of 1999, (NHRA) from *inter alia*, destruction or damage, excavation or removal, or other disturbance, without a permit from the responsible heritage resources authority. The National Heritage Resources Act, No 25 of 1999, (NHRA) states that heritage resources are unique and non-renewable and, as such, any impact on such resources must be seen as significant (NHRA, section 5(1)(a)). The NHRA specifically protects certain categories of heritage resources, i.e.: structures, archaeological and paleontological (including meteorological) sites and material and graves and burial grounds (NHRA, sections 34, 35 and 36). Furthermore, Section 38 of the NHRA provides for and regulates the compilation of impact assessment reports of heritage resources that may be affected by construction or development activities.

The desktop research for the Heritage Scoping Report has revealed that the study area and surrounding landscape have a long and diverse historical and archaeological history and that significant potential exists for archaeological and historical sites and material to be located within the study area. The research has also identified specific possible heritage sensitive areas within the study area. A site visit was undertaken of the overall study area which identified a total of 45 heritage sites comprising 21 cemeteries, 22 historic structures and buildings, one Stone Age site, one historic midden of archaeological age and one site comprising historic road markers.

The Scoping Report will be followed by a a Heritage Impact Assessment (HIA), which would include the findings of this desktop study report and would provide recommendations for mitigation (destruction, recording and/or avoidance) of the confirmed heritage resources to be impacted upon by the proposed development. The period in-between the existing Heritage Scoping Report and the Final Heritage Impact Assessment Report will be used to finalise any footprints relating to the proposed exploration activities.

The Heritage Scoping Report has highlighted a number of heritage aspects, some of which would require further assessment and mitigation in the subsequent Heritage Impact Assessment report. These aspects are palaeontology, historic buildings and structures, archaeological sites, cemeteries, the Battle of Zand River (7 – 10 May 1900), historic diamond mining activities on the farm Welgegund as well as unmarked graves from within the study area.

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Battle of Zand River (7 – 10 May 1900)

The archival and historical desktop study has revealed that during the Battle of Zand River (7 May -10 May 1902), units of the British cavalry under command of General John French crossed over the Du Preez Leger Drift to outflank the Boer position on the northern bank of the river. This drift is located within the study area, where the bridge on the road between Welkom and Theunissen is located. This said, and based on available literature, no shots were fired here as the drift was not held by the Boer forces.

Archaeological field surveys of the proposed development footprint areas during the Heritage Impact Assessment should identify any tangible remains of these events. Additionally, should any development footprints be proposed within 600 m of the contemporary bridge where the R30 between Welkom and Theunissen crosses over the Sand River, further archival and historic research must be undertaken of the battle and any impacts that these development footprints may have on this component of the battlefield. If required, further mitigation measures will be outlined in the Heritage Impact Assessment.

Historic Diamond Mining Activities on the Farm Welgegund (Currently Driekoppies)

The archival and historical desktop study has revealed that historic diamond prospecting and mining activities occurred on the farm Welgegund. These activities were already in progress by the early 1890s, and appears to have continued almost unabated until the early 1930s. Mining activities appear to have continued more recently at Welgegund, but by the time of the site visit in 2016 these activities had evidently long been abandoned as well. One of the first companies involved here appears to have been the Van Rensburg Diamond Syndicate. The syndicate soild its interest in the farm to the Driekopjes Diamond Mining Company in 1892. Of interest is that the Driekopjes Company had Sir Thomas Major Cullinan as a founding director. Subsequent diamond mining companies involved at Welgegund include the New Driekopjes, Magnus, Triumph and Welgegund.

Archaeological field surveys of the proposed development footprint areas during the Heritage Impact Assessment should identify any tangible remains of these activities. Additionally, should any development footprints be proposed within 1 000 m of the centre of the mine pit on the farm Welgegund, further archival and historic research must be undertaken of the history and layout of the mine. If required, further mitigation measures will be outlined in the Heritage Impact Assessment.

Historic Buildings and Structures

Evaluation of archival and historic maps and satellite imagery, coupled with the fieldwork, have revaled that a number of historic buildings and structures are located within the study area. However, more sites may still be located within

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the overall study area. As a result, should any development footprints be defined, such footprint areas will have to be assessed in the field by way of archaeological field surveys to identify these features within the development footprint areas. Additionally, an assessment by an architectural historian of each historic building and structure located within or near such footprint areas will also have to be undertaken. These studies will be required to determine significance of each building or structure and will assess the possible development impacts on each of them during the Heritage Impact Assessment phase. At the same time appropriate mitigation measures will also be outlined.

Graves and Cemeteries

The site visit identified 21 cemeteries, with one additional cemetery not visited in the field confirmed by a previous heritage study. It is likely that even more cemeteries and grave sites are located within the study area. Any marked graves and cemeteries located within future development footprint areas will be identified during the archaeological walkthroughs of those footprint areas. Cemeteries and grave sites are protected by various legislations and the best option would be the in situ preservation of the sites. Should this not be possible, a standard grave relocation process (including a detailed social consultation process) must be undertaken.

Unmarked Graves in Homesteads

An evaluation of the available historic maps has revealed a significant number of historic homesteads of black African communities within the study area. The presence of these features raises another heritage concern, that of unmarked stillborb babies. In terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Cemeteries and grave sites are protected by various legislations and the best option would be social consultation with the former (or present) residents of this area to assess whether any such unmarked graves are located within the final study area for the HIA coupled by archaeological monitoring of the development activities.

Archaeological Sites

Evaluation of archival and historic maps and satellite imagery, coupled with the fieldwork, have revaled that archaeological sites such as Middle Stone Age and Later Stone Age surface scatters, Historic Farmsteads and Historic Middens of Archaeological Age may very likely be located within the general study area. These sites are protected by the National Heritageb Resources Act. While some of these sites were identified during the site visit, others may still be located within the study area. As a result, should any further development footprints be defined, such additional footprint areas will have to be assessed in the field by way of archaeological field surveys to identify any such features which may be located there. These studies will be required to determine the significance of each site and to assess the

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possible development impacts on each of them during the Heritage Impact Assessment phase. At the same time appropriate mitigation measures will also be outlined.

Palaeontology

A palaeontological desktop study was undertaken by Dr. Gideon Groenewald, which revealed that the present study area is mainly underlain by by Permian aged rocks of the Adelaide Subgroup and Jurassic aged dolerite of the Karoo Supergroup as well as Quaternary aged Aeolian sand of the Gordonia Formation and Tertiary aged sediments associated with terrestrial deposits mainly referred to as the Matjhabeng type sediments close to Virginia in the Free State.

The very high fossiliferous potential of the Adelaide Subgroup, Beaufort Group strata, warrants an allocation of a Very High palaeontological sensitivity to the areas underlain by the rocks of this Subgroup. A similarly Very High Palaeontological sensitivity is allocated to Tertiary aged sediments in this region. The Gordonia Formation is allocated a High Sensitivity and Dolerite areas are allocated Very Low Palaeontological sensitivity. If extensive excavation of topsoil and removal of more than 3m of soil cover is planned in this region, all the areas of activity will be allocated a Very High Palaeontological Sensitivity as these rocks can contain very significant remains of plants and animals that will contribute significantly to our understanding of the palaeo-environments in this part of the Karoo Basin.

The following recommendations are made:

- The EAP as well as the ECO for this project must be made aware of the fact that the Beaufort Group sediments contains very highly significant fossil remains, albeit mostly exposed during infrastructure development. Several types of fossils have been recorded from this Group in the Karoo Basin of South Africa, with special mention of the Adelaide Subgroup. Similar fossil richness is observed in Tertiary aged sediments at Matjhabeng.
- In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is envisaged (following the geotechnical investigation), or where fossils are recorded during the geotechnical investigations, a qualified palaeontologist must be appointed to assess and record fossils at specific footprints of infrastructure developments (Phase 1 PIA) before development as well as during excavations for the development.
- The Aeolian sand of the Gordonia Formation covers the rocks of the highly significant Adelaide Subgroup and all the areas underlain by this formation is allocated a High Palaeontological sensitivity and a qualified Palaeontologist must visit all the sites of outcrop before excavation and during the activities of the Project if excavation will be deeper than 1.5m.
- These recommendations must form part of the EMP of the project.

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The data on the different types of heritage resources identified from the fieldwork will be compiled in a final HIA report. This report will utilise the Plan of Study for the EIA/HIA (***Section*** 8) as well as the significance rating (***ANNEXURES A and B***) to identify and rank the impacts on the heritage resources into the final detailed EIA investigation.

Potential impacts to be identified and evaluated during the EIA include:

- Disturbance / destruction of components of the battlefield on which the Battle of Zand River (7-10 May 1900) took place during the South African War - Physical survey of any proposed footprint areas by an experienced archaeologist, adherence to any required mitigation measures and the requirement for further archival and historical desktop study work on the battle should any component of the proposed development footprint be located within 600 m from the bridge on the road between Welkom and Theunissen.
- Disturbance / destruction of possible tangible remains which may be associated with the historic diamond activities on the farm Welgegund – Physical survey of any proposed footprint areas by an experienced archaeologist, adherence to any required mitigation measures and the requirement for further archival and historical desktop study work on the battle should any component of the proposed development footprint be located within 600 m from the bridge on the road between Welkom and Theunissen.
- Disturbance / destruction of palaeontological material – Recommendations from the palaeontological desktop study must be outlined in the EIA and EMP and must be undertaken as mitigation measures.
- Disturbance / destruction of historic buildings and structures – Avoidance of identified historic buildings and associated structures (where possible), physical survey of any proposed additional footprint areas, possible inclusion of architectural historian, adherence to any required mitigation measures.
- Disturbance / destruction of cemeteries and graves - Avoidance of identified graves and cemeteries (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures.
- Disturbance / destruction of unmarked stillborn graves - Avoidance of identified historic black African homesteads (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures including social consultation and archaeological monitoring during construction phase.
- Destruction / damage of archaeological sites – Avoidance of identified sites (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures

The desktop evaluation of the study area and surrounds has shown that the possibility exists of finding various heritage resources in the proposed study area, including historical structures as well as graves and cemeteries. A site visit was undertaken during which the findings of the desktop study was confirmed in that a total of 45 heritage sites comprising

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21 cemeteries, 22 historic structures and buildings, one Stone Age site, one historic midden of archaeological age and one site comprising historic road markers.

It must be noted that the fieldwork for the present report was only a heritage scoping visit aimed at accessing as many properties as possible. No detailed walkthrough of any particular areas were undertaken. Once the development footprint areas are defined, these will have to be assessed by way of detailed walkthroughs during the HIA phase of the project. This will allow for an assessment of the impact of the proposed development on any heritage sites located there.

Table 1- Potential Impacts to Consider for the Heritage Impact Assessment Phase

	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF SECTIONS OF THE BATTLE OF ZAND RIVER**	**CONSTRUCTION**
DISCUSSION	The archival and historical desktop study has revealed that during the Battle of Zand River (7 May -10 May 1902) units of the British cavalry under command of General John French crossed over the Du Preez Leger Drift to outflank the Boer position on the northern bank of the river. This drift is located within the study area, where the bridge on the road between Welkom and Theunissen is located. This said, no shots were fired here as the drift was not held by the Boer forces.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Battlefields are protected by the NHRA, and under certain circumstances the core components of a particular battle site can be defined as a cultural landscape worth protecting. As no shots were fired at the drift or within the study area, the predicted impact will not be high enough to warrant a total exclusion of this area. Should any footprints be located within or near the drift, archaeological fieldwork and further archival and historical research should represent sufficient identification of any	Destruction or damage during the construction of the pipelines and other development components.

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	remaining tangible heritage aspects (i.e. camp sites used during the battle).	
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. This should be augmented by further archival desktop study work on the battle. Should tangible or intangible sites or features be identified that will be impacted upon by the proposed development, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED	During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation and mitigation of identified tangible components of the battle must be planned and scheduled to fit within the timing of the project phases.	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF TANGIBLE REMAINS OF THE OLD DIAMOND MINE AT WELGEGUND**	**CONSTRUCTION**
DISCUSSION	The archival and historical desktop study has revealed that diamond prospecting and mining activies were already undertaken by the 1890s on the farm Welgegund, located within the present study area. Historic mining activities continued intermittently until the 1930s, and based on information presently available, mining activities continued here after a hiatus of many decades. No mining activities currently takes place on site. Of heritage significance would be all tangible mining remains older than 100 years and buildings older than 60 years. In fact, one such a building was identified during the site visit in close proximity to the mine (see Site 4).	

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EXISTING IMPACT	During the site visit, the mine site was also briefly visited and based on what was evident at the time, it would appear that tangible aspects relating to the historic diamond mining may have have been destroyed during later development and activities at the mine.	
PREDICTED IMPACT	Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction or damage of such sites requires a permit from the responsible heritage authority (NHRA, section 35). Fieldwork can provide valuable information on such sites in the study area and provide timeous management of such sites through various mitigation measures, including the realignment of the construction activities, if necessary.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. Should archaeological sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED	During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation of sites must be planned and scheduled to fit within the timing of the project phases.	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF ARCHAEOLOGICAL SITES**	**CONSTRUCTION**
DISCUSSION	As seen from the archival work and discussion, the possibility of archaeological finds has been identified. During the fieldwork, two such archaeological sites were identified namely a Middle Stone Age surface scatter as well as a	

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	Historic Midden. The possibility certainly exists for more archaeological sites to be located within the study area, Once the development footprint areas have been confirmed, an archaeological foot survey must be undertaken of these footprint areas to identify any archaeological sites located there. This would assist in developing a comprehensive Heritage Management Plan for the construction activities.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction or damage of such sites requires a permit from the responsible heritage authority (NHRA, section 35). Fieldwork can provide valuable information on such sites in the study area and provide timeous management of such sites through various mitigation measures, including the realignment of the construction activities, if necessary.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. Should archaeological sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED	During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation of sites must be planned and scheduled to fit within the timing of the project phases.	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF HISTORIC BUILDINGS OR STRUCTURES**	**CONSTRUCTION, OPERATION**

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DISCUSSION	The existence of historic buildings and structures within the study area has been confirmed during the site visit. During the fieldwork, a total of 22 sites comprising such buildings and structures were identified. The possible presence of even more historic structures was also revealed during the desktop study.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Damage/destruction of farm buildings and associated structures either directly (during construction of infrastructure or mining) or indirectly (i.e. blasting and vibration). Destruction or damage of such sites older than 60 years, would requiree a permit from the responsible heritage authority.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Avoidance of the identified farm buildings and associated structures in future proposed exploration footprints (where possible) and an archaeological field survey of any additional footprint areas not yet assessed. Should such sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED	During design and before construction, - Baseline assessment of structures - Permitting and controlled destruction of sites Operational - Evaluation of structures during mining against baseline data	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF GRAVES AND CEMETERIES**	**CONSTRUCTION**
DISCUSSION	The existence of graves and cemeteries has been confirmed during the site visit, with 21	

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	cemeteries identified during the fieldwork, one cemetery known from a previous heritage assessment from within the study area and the likely presence of even more cemeteries revealed during the desktop study.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified graves and cemeteries and the discovery of such sites can seriously hamper construction and development timelines. Damage, destruction or removal of such sites requires a permit from various responsible authorities, including the Heritage Authority (NHRA, section 36), Provincial Health Department and the SA Police Service. Such a process can take up to 12 months to finalise. Fieldwork can provide valuable information on the presence of such sites in the study area and provide timeous management of such sites, which may include the realignment of the proposed development activities. In the event that identified graves and cemeteries cannot be avoided, a grave relocation process needs to be initiated, bearing in mind that such a process impacts on the spiritual and social fabric of the next of kin and associated communities.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Avoidance of the identified cemeteries and graves in future proposed exploration footprints (where possible) and an archaeological field survey of any additional footprint areas not yet assessed. Should graves and cemeteries be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED	During design and before construction no-go areas need to be demarcated. Alternatively, mitigation measures such as the	

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	physical relocation of the graves in question (including aspects such as detailed social consultation) needs to be planned and scheduled to fit within the timing of the project phases. It must be understood that such a process may have an impact on the spiritual and social fabric of the next of kin and associated communities.	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF UNMARKED GRAVES**	**CONSTRUCTION**
DISCUSSION	From experience on similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the homesteads of black rural communities. These children were sometimes buried underneath the floors and walls of houses and huts and the burials were not marked, but were known to the immediate family.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified graves and the discovery of such sites can seriously hamper construction and development timelines. Damage, destruction or removal of such sites requires a permit from various responsible authorities, including the Heritage Authority (NHRA, section 36), Provincial Health Department and the SA Police Service. Such a process can take up to 12 months to finalise. Social consultation with present and former residents of the study area can provide valuable information on the presence of such sites in the study area and provide timeous management of such sites, which may include the realignment of the proposed development activities.	Destruction or damage during the construction of the pipelines and other development components.

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	Archaeological monitoring of the development footprint areas will identify any unmarked human skeletal remains. In the event that such graves cannot be avoided, a grave relocation process needs to be initiated, bearing in mind that such a process impacts on the spiritual and social fabric of the next of kin and associated communities.	
EIA INVESTIGATION REQUIRED	A social consultation process with current and former residents of the study area can assess whether such sites are located within the study area. Archaeological monitoring during construction will also identify any human skeletal remains.	
WHEN IS MITIGATION REQUIRED	During design and before construction, social consultation needs to take place to assess whether such sites are located within the footprint areas. Archaeological monitoring during the construction phase will also identify any human remains.	
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE, DAMAGE OR DESTRUCTION OF PALAEONTOLOGICAL RESOURCES**	**CONSTRUCTION, OPERATIONAL**
DISCUSSION	A palaeontological desktop study was done by Dr. Gideon Groenewald, which revealed that most of the study area has a High Palaeontological Sensitivity whereas sections of the area have Very High Palaeontological Sensitivity with others allocated a Very Low Palaeontological Sensitivty.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified palaeontological resources and the discovery of such resources can seriously hamper construction and development timelines. Damage, destruction or	Destruction or damage during the construction of the pipelines and other development components.

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	removal of such sites require a permit from the responsible heritage authority (NHRA, section 35).	
EIA INVESTIGATION REQUIRED	The mitigation measures recommended in the palaeontological desktop study must be undertaken.	
WHEN IS MITIGATION REQUIRED	During design and before construction, the mitigation measures outlined in the palaeontological desktop study will have to be undertaken. These are as follows: a) The EAP as well as the ECO for this project must be made aware of the fact that the Beaufort Group sediments contain very highly significant fossil remains, albeit mostly exposed during infrastructure development. Several types of fossils have been recorded from this Group in the Karoo Basin, with special mention of the Adelaide Subgroup. Similar fossil richness is observed in Tertiary aged sediments at Matjhabeng. b) In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is envisaged (following the geotechnical investigation), or where fossils are recorded during the geotechnical investigations, a qualified palaeontologist must be appointed to assess and record fossils at specific footprints of infrastructure developments (Phase 1 PIA) before development as well as during excavations for the development. C) The Aeolian sand of the Gordonia Formation covers the rocks of the highly significant Adelaide Subgroup and all the areas underlain by this formation is allocated a High Palaeontological sensitivity. A qualified palaeontologist must visit all the	

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	sites of outcrop before excavation and during the activities of the Project if excavation will be deeper than 1.5m. d) These recommendations must form part of the EMP of the project.

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1. INTRODUCTION

PGS Heritage was appointed by Environmental Impact Management Services (EIMS) to undertake a Heritage Scoping Report for the proposed Cluster 1 project by Tetra4 (Pty) Ltd. The study area is located between Welkom and Theunissen, Matjhabeng and Masilonjana Local Municipalities, Lejweleputswa District Municipality, Free State Province.

2. SCOPE OF WORK

PGS Heritage was appointed by EIMS, to undertake a Heritage Scoping Assessment (HSA), that will be used (with other specialist desktop studies) to assess the feasibility of the proposed project as well as to design the proposed project in such a way that impacts are minimised. The HSR is aimed at identifying potential heritage resources located within the study area and surrounds and to identify the potential impacts that may be experienced by the resources as a result of the proposed project. Additionally, a site visit was undertaken during which some of the potential heritage sites were confirmed as heritage sites. In addition, the scoping study will serve as a Plan of Study for the HIR, which will include a detailed investigation of the heritage resources and the impact the proposed project may have on them. Mitigation measures will then also be suggested that will contribute to the overall EMPR for the whole project.

The scope of work for the Scoping Phase of the project can be itemised as follows:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding as well as site specific environment);
- Identification and description of any sensitive receptors in terms of heritage features that occur in the study area, and the manner in which these sensitive receptors may be affected by the activity;
- Site visit to verify desktop information;
- Screening to identify any critical issues relating to cultural heritage (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map identifying sensitive receptors in the study area, based on available maps, database information & site visit verification;
- Provide a GIS sensitivity map of the study area;
- Identification and description of any impacts that may result from the proposed activities (both mining and supplementary) during all phases of the project, including cumulative, residual and latent impacts. All phases of the project should be considered and these phases shall be classified as: (a) Planning and Design (b) Construction (c) Operation (d) Decommissioning and (e) Rehabilitation and Closure.
- Identification of any legislated constraints (e.g. "No-Go" areas or buffer zones) and preparation of a map illustrating No-Go areas and buffers (if relevant);

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- Identify any gaps in knowledge, data or information that could hamper the impact identification and evaluation process;
- Identification and justification (screening to obtain key issues) of impacts which require further investigation during the EIA phase (including further specialist inputs);
- Identify any legal provisions relevant to the specific field of expertise and the proposed activity (including relevant legislation, both National and Provincial, Department Guidelines and Management Frameworks);
- Provide a detailed plan of study for the EIA and EMP, including;
- A description of the tasks that should be undertaken and the manner in which these tasks should be undertaken;
- A description of the proposed methodology;
- Presentation of the study findings to the client.

2.1 Site Location

The study area for this report comprises portions of the following farms:

Adamsons Vley 655	Deeldam 106
Blaauwdrift 188	Kleinpan 320
Mond van Doorn Rivier 38	Zoetendal 243
Helpmekaar 47	Boschluis Spruit 278
Anex Glen Ross 562	Enkeldoorn 360
Kalkoenkrans 225	Brakspruit 121
Palmietkuil 328	Nortier 361
Zonderzorg 342	Jordaan 1
Damplaats 341	Excelsior 147
Terra Blanda 155	Goedemoed 143
Frisgewaagd 550	Grottkau 410
Driekoppies 422	Leeuwbult 52
Retreat 118	Middelplaas 583
De Wilger 544	Doornrivier 330
Hendriena 563	

The coordinates defining the study area boundary are as follows:

- Northernmost point on Adamsons Vley - S 28.069966 E 26.749753

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- Westernmost point on Retreat - S 28.271194 E 26.633309
- Easternmost point on Leeuwbult - S 28.265545 E 26.798854
- Southernmost point on Goedemoed - S 28.296379 E 26.756875

As such, the overall study area for the present Heritage Scoping Report covers an area of approximately 13 700 ha, with an approximate boundary circumference of 99 400 m.

A locality map depicting the study area within its regional context can be seen in Figure 1.

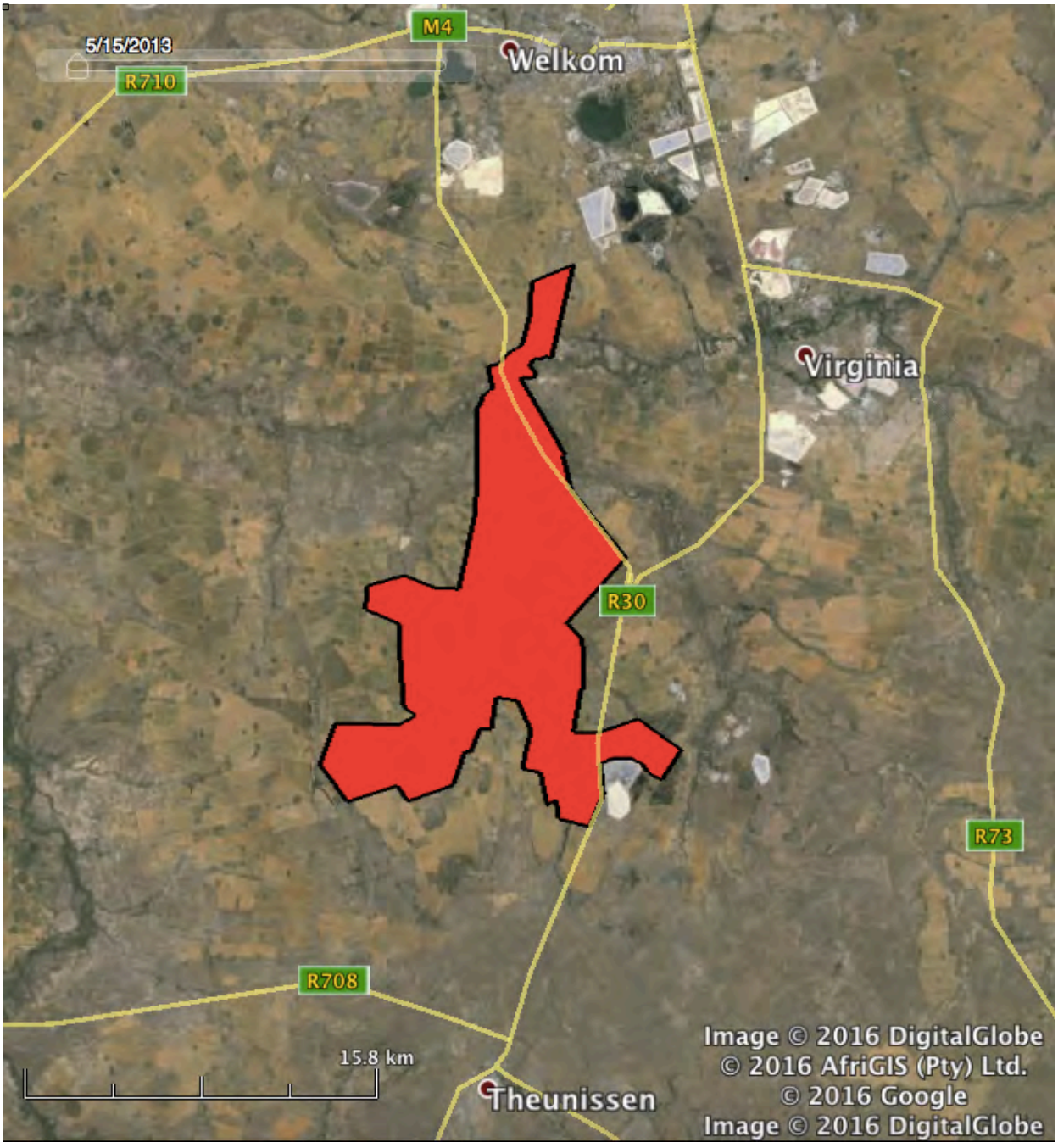

Figure 1 - The study area within its regional context

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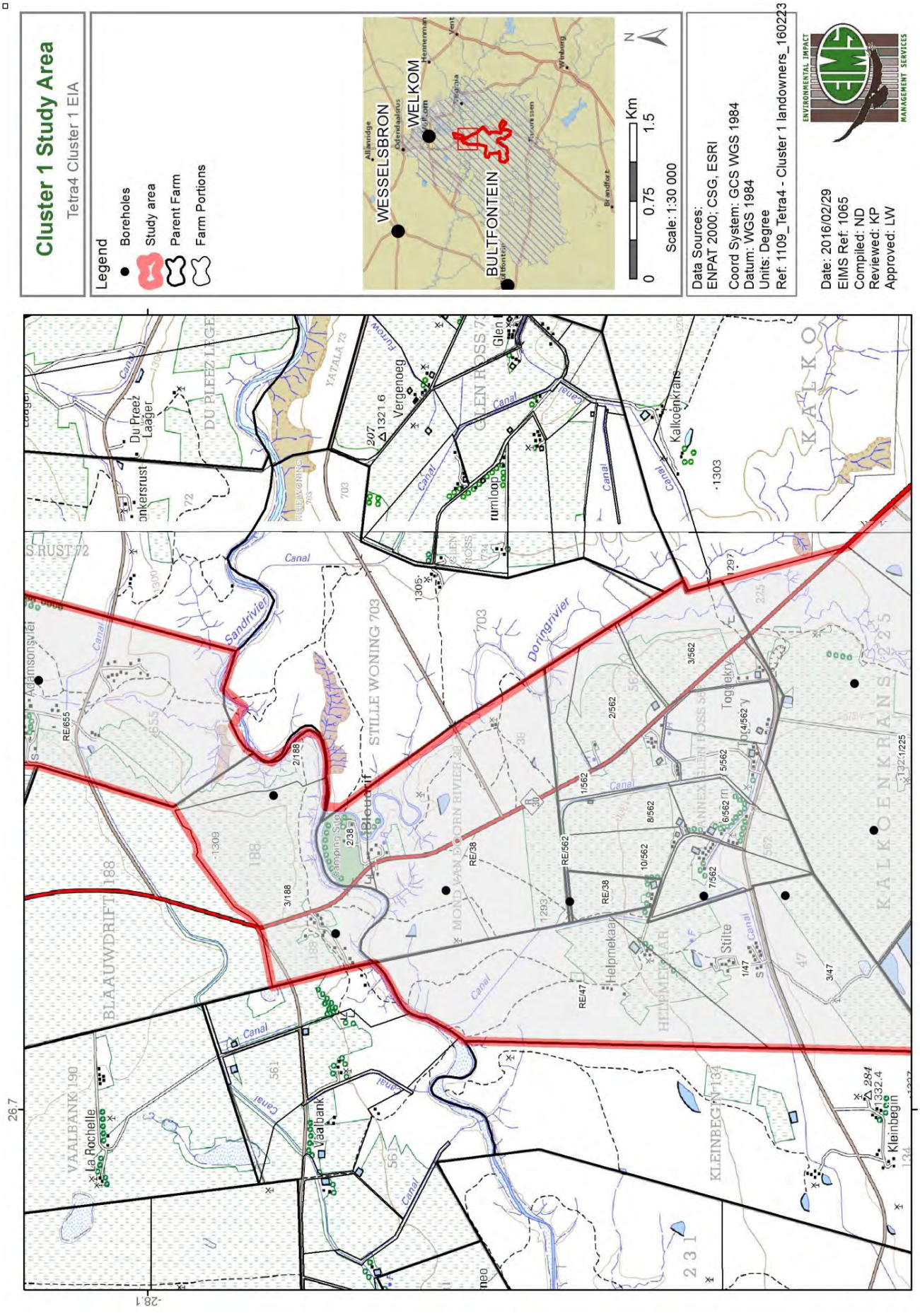

Figure 2 – Map provided by the client which depicts the northern half of the study area.

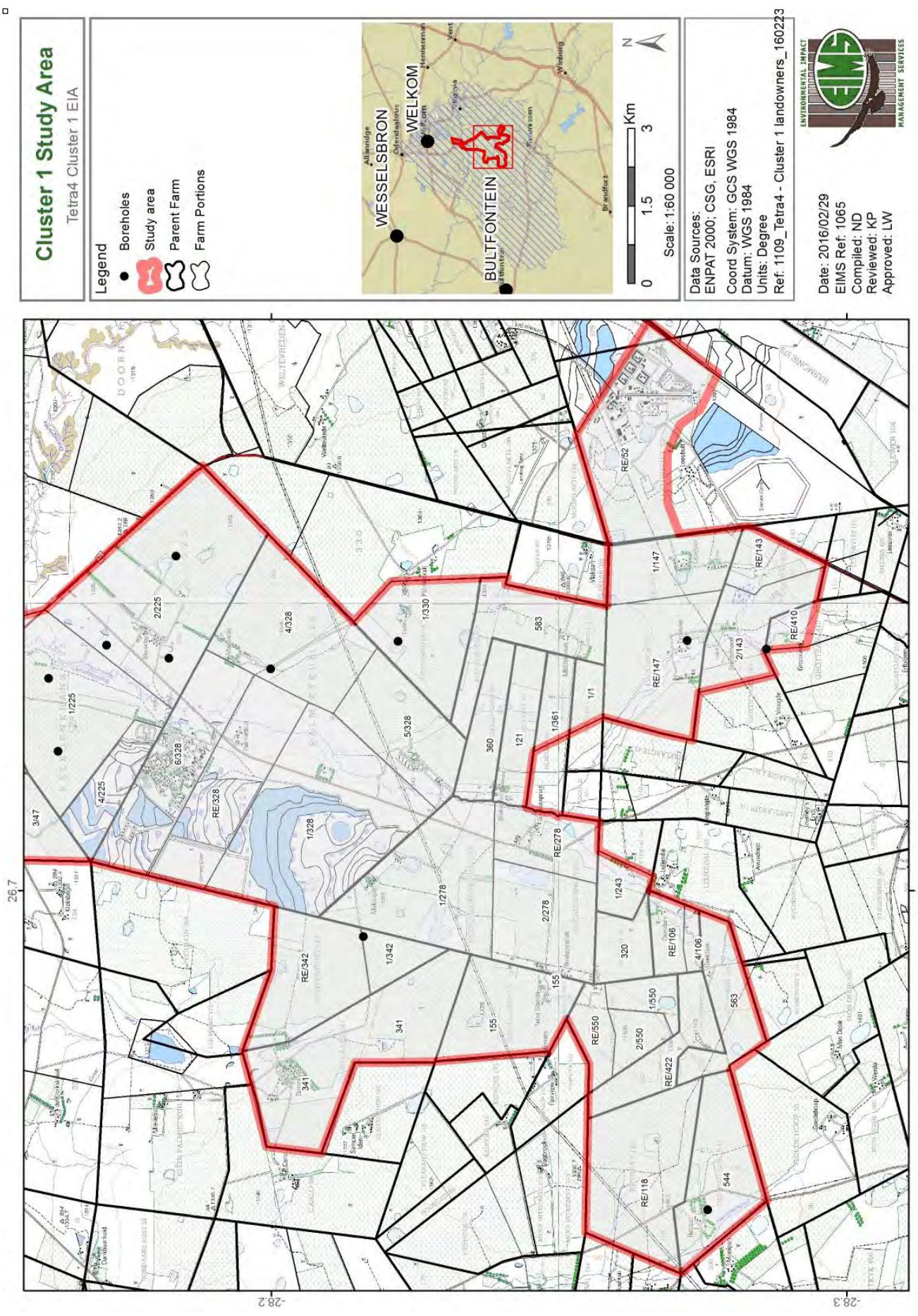

Figure 3 – Map provided by the client which depicts the southern half of the study area.

3. METHODOLOGY

An evaluation of the archaeological and historical background of the study area was required to establish the possible heritage resources to be found. Therefore, a literature search of published sources, archival sources and internet sources were undertaken to compile a general background of the study area and surrounding landscape. This was followed by study area specific research to identify potential heritage impacts which may be located within the study area. This component comprised an assessment of archival and historical maps as well as an examination of Google Earth satellite imagery. The third component of the research comprised a site visit during which forty five heritage sites were identified. As stated elsewhere, these 45 heritage sites do not represent the entire heritage site database of the study area. As such a more detailed heritage inventory would be required during the Heritage Impact Report phase of the project.

4. LEGISLATIVE AND POLICY FRAMEWORK

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

i. National Environmental Management Act (NEMA), Act 107 of 1998
ii. National Heritage Resources Act (NHRA), Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
iv. Development Facilitation Act (DFA), Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources:

i. National Environmental Management Act (NEMA), Act 107 of 1998:
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Plan (EMP) – Section (34)(b)
ii. National Heritage Resources Act (NHRA), Act 25 of 1999:
    a. Protection of Heritage resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Minerals and Petroleum Resources Development Act (MPRDA), Act 28 of 2002:
    a. Section 39(3)
iv. Development Facilitation Act (DFA), Act 67 of 1995:
    a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

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The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…" The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b):

The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".
A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b)and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008b).

MPRDA defines 'environment' as it is in the NEMA and therefore acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible HSR report is compiled.

The heritage impact assessment criteria to be utilised in the HIR are described in more detail in ***Annexure A***; while the Environmental Impact Scoring criteria to be utilised in the HIR, are provided in ***Annexure B***.

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4.1 Assumptions and Limitations

The following assumptions and limitations with regard to the present study exist:

- The aim of the Heritage Scoping Report is to identify the possible types of heritage resources that might be present in the study area, as well as possible hotspots for the locality of such resources. From this, the possible impacts from mining and ancillary activities must be predicted. Although a site visit has already been undertaken to confirm some of these possibilities, it must be noted that the results of this report will require confirmation by undertaking a physical survey as part of the final evaluation of the development footprints during the EIA Phase. Since the current information is based only on a literature and archival search and investigation of other desktop resources (maps and satellite imagery), with one brief site visit, **this report can certainly not be seen as at the level required for a HIR**.

4.2 Terminology/Abbreviations

Table 2- Abbreviations

ACRONYMS	*DESCRIPTION*
ASAPA	Association of South African Professional Archaeologists
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
DMR	Department of Mineral Resources
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HIR	Heritage Impact Report
HSR	Heritage Scoping Report
I&AP	Interested & Affected Party
LSA	Later Stone Age
LIA	Late Iron Age

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MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency

The following definitions are taken from the National Heritage Resources Act, no 25 of 1999 (NHRA, section 2):

Archaeological resources

This includes:

i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
iii. wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in the change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;

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ii. carrying out any works on or over or under a place;
iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
iv. constructing or putting up for display signs or boards;
v. any change to the natural or existing condition or topography of land; and
vi. any removal or destruction of trees, or removal of vegetation or topsoil

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance

Holocene

The most recent geological time period which commenced 10 000 years ago.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

5. TECHNICAL DETAILS OF THE PROJECT

Tetra4 (Pty) Ltd proposes the Cluster 1 development, which entails the first phase production of gas from 12 historic wells. The development would also entail the following:

- placement of well heads at each well to boost recovery
- the construction of pipelines
- erection of in-line gas booster pumps and infield gas repricocating gas compressors
- the construction of a helium plant.

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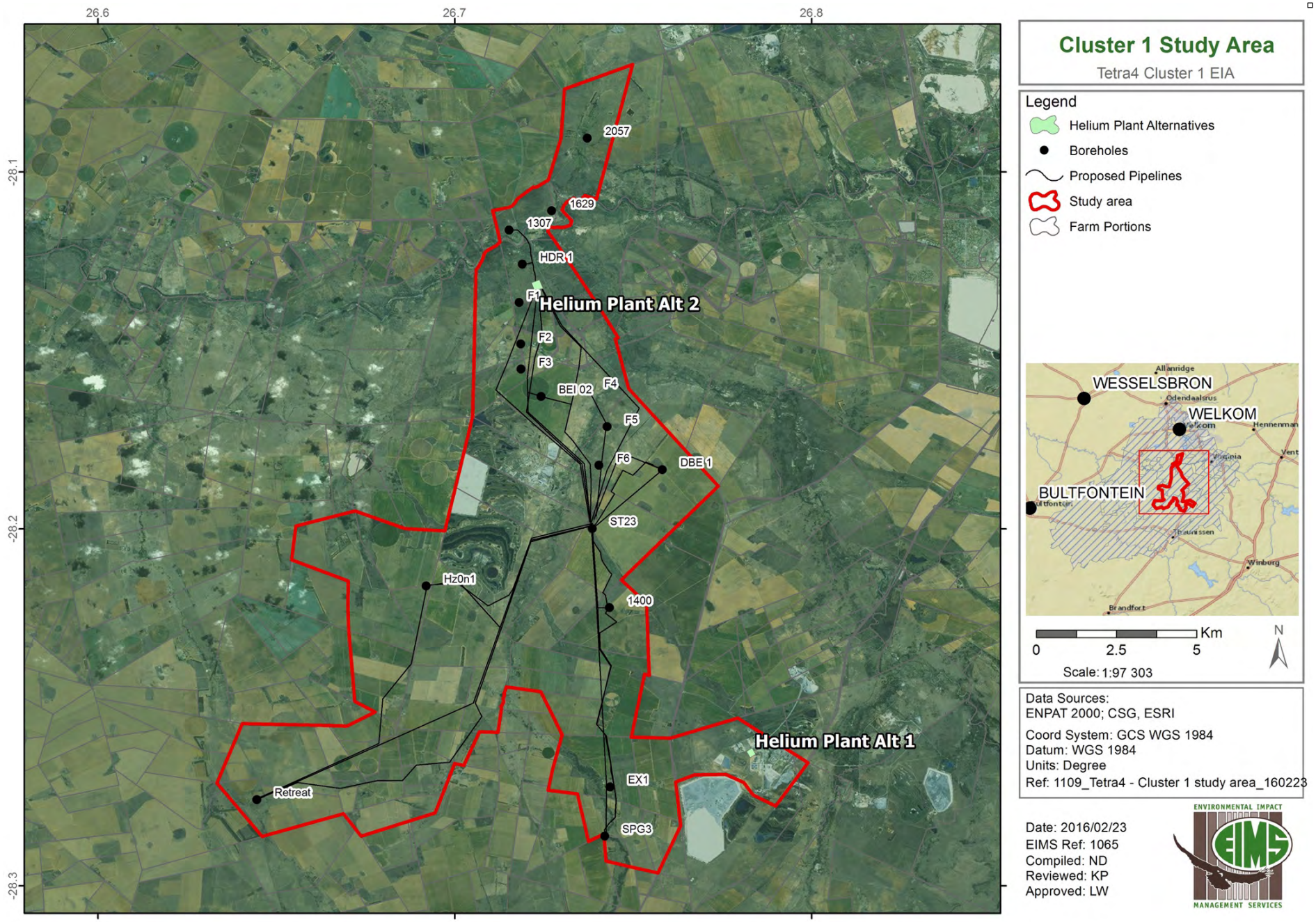

Figure 4 – Provisional development layout plan with development alternatives. Map provided by EIMS.

6. GENERAL BACKGROUND TO THE STUDY AREA AND SURROUNDING LANDSCAPE

6.1 Historical and Archaeological Overview of the Study Area and Surrounding Landscape

The Free State has a rich archaeological and historical history going back millions of years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter-gatherers, Nguni agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915).

The archaeological history of the area can broadly be divided into a Stone Age, Iron Age and Historic Period. Both the Stone and Iron Ages form part of what is referred to as the Pre-Colonial Period (Prehistoric Period) whereas the Historic Period is referred to as the Colonial Period (Historic Period) (refer **Figure 2**).

In the table below a detailed archaeological and historical overview of the study area and surrounding landscape is presented in a chronological manner. This overview is based on intensive archival and literature research and whenever possible, the relative distances between the study area and mentioned sites, features and events are provided.

It must be noted that such an overview, which is based on available literature and archival research, would necessarily reflect a bias toward a traditional white history of the region as this would have been the focus of publications and archival documents during the last 150 years.

In Section 7.3 below a discussion on previous archaeological and heritage studies from within the study area as well its surroundings will be provided. This discussion is based on previous reports that could be located on the South African Heritage Resources Information System (known as SAHRIS) and records of the SAHRA APM Report Mapping Project.

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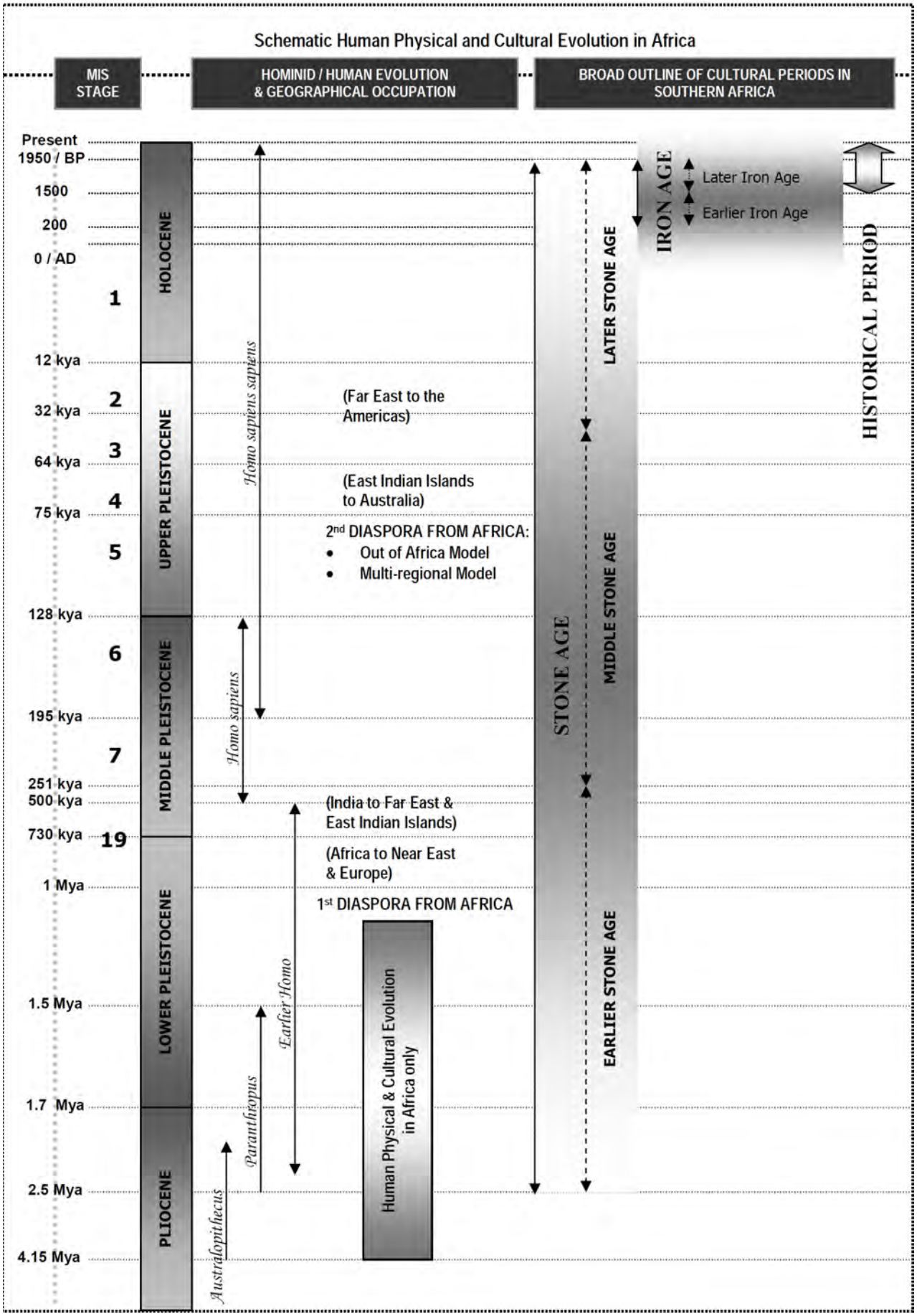

Figure 5 – Human and Cultural Time line in Africa (Morris, 2008)

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Table 3- Archaeological and Historical Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
The Study Area during the Stone Age	
Very little is known about the Stone Age archaeology of the study area and its immediate surroundings. In the wider surroundings, probably the most significant Stone Age is at Florisbad, located roughly 78 km south-west of the present study area. Closer to the study area, a number of Middle and Later Stone Age material in associated with mammal fossil remains have been identified in erosion gulleys along the Sand, Doring and Vet Rivers between Virginia and Theunissen (De Ruiter *et. al.* 2011). See also Rossouw (n.d.).	
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago. No information regarding ESA sites from the study area or surroundings could be located.
>250 000 to 40 000 years ago	The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley, 2013). During research fieldwork by the National Museum in Bloemfontein, ten sites were recorded where Middle Stone Age and/or Later Stone Age lithics were identified in association with mammal fossil remains from erosion gulleys along the Sand, Vet and Doring Rivers (De Ruiter *et. al.* 2011). While almost all of these sites are located within a distance of 20 km of the present study area, one site is located immediately adjacent to the study area. This site is named Kalkoenkrans

	225 and is located no more than 500 m north-east of the study area. During the fieldwork for the present study, a Middle Stone Age site was also identified within the study area on the northern bank of the Sand River (see Site 33 below).

Figure 6 – Cropped version of a photograph of Kalkoenkrans 225 as published in De Ruiter *et. al.* (2011).

40 000 years ago to c. 1800s	The Later Stone Age (LSA) is the third archaeological phase identified and is characterised by an abundance of very small stone tools known as microliths as well many rock art sites across the country. This period is associated with hunter-gatherers (San) as well as early pastoralists (Khoekhoe) and lasted up until - and in many cases a considerable number of years after – the arrival of Iron Age and European communities. Apart from the occurrence of Later Stone Age lithics along the Sand, Vet and Doring Rivers (see above), no other Later Stone Age sites are known from the surroundings of the study area. Similarly, no known rock art sites are known from the study area or its wider surroundings.

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The Study Area during the Iron Age	
The arrival of early farming communities during the first millendium, heralded in the start of the Iron Age for South Africa. The Iron Age is that period in South Africa's archaeological history associated with pre-colonial farming communities associated with agricultural and pastoralsit farming activites, metal working, cultural customs such as lobola as well as the tangible representation of the significance of cattle imprinted on their settlement layouts (known as the Central Cattle Pattern) (Huffman, 2007). According to the distribution map for Iron Age settlements on the Southern Highveld as published in Maggs (1976), the study area is located to the west of the known distribution of such Late Iron Age sites. It is therefore unlikely for any Late Iron Age sites to be located within the study area or its immediate surroundings. This surmise is largely supported by the distribution maps as published by Huffman (2007), albeit these latter distribution maps (which are based on known archaeological information) indicate that the study area is located very close to the periphery of a small number of Iron Age facies. For the sake of completeness, these will be discussed below. It must be noted that these two Iron Age facies occurred in the surroundings of the study area during roughly the same time. While the known archaeological evidence for the Thabeng facies is found as far south as present-day Odendaalsrust (roughly 24 km north of the study area), the known archaeological evidence for the Makgwareng facies are found in proximity to Winburg (some 35 km south-east of the study area). From this information, it appears unlikely for any Iron Age sites to be located within the study area.	
AD 1700 – AD 1840	The Thabeng facies of the Moloko Branch of the Urewe Tradition is the next Iron Age period to be identified within the surroundings of the study area. The decoration on the ceramics associated with this facies is characterised by incised triangles, coloured chevrons and arcades (Huffman, 2007).
AD 1700 – AD 1820	The Makgwareng facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the next known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by finely stamped triangles, rim notching and appliqué (Huffman, 2007). This facies developed from Ntsuanatsatsi south of the Vaal River and can be associated with the Type V stone walling settlement type (Huffman, 2007), the name of which is derived from Vegkop (Maggs, 1976). Van Riet Lowe (1927) was one of the first to record these structures. Dreyer (1990) also conducted excavations on Type V Late Iron Age stonewalled settlements located a short distance south-west of Winburg.

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The Type V settlements comprise a core of cattle enclosures surrounded by beehive huts. Corbelled stone huts are associated with this walling type. They are low stone huts located at the edge of the cattle enclosures and were where the boys herding the cattle often lived (Huffman 2007). As suggested by Huffman (2007), the corbelled huts were in fact beehive huts made of stone rather than grass and reeds. Furthermore, the presence of beehive huts at these sites necessarily indicates a Nguni association or origin with these settlements.

Figure 7 – Corbelled stone huts associated with a Type V settlement (Huffman, 2007:39).

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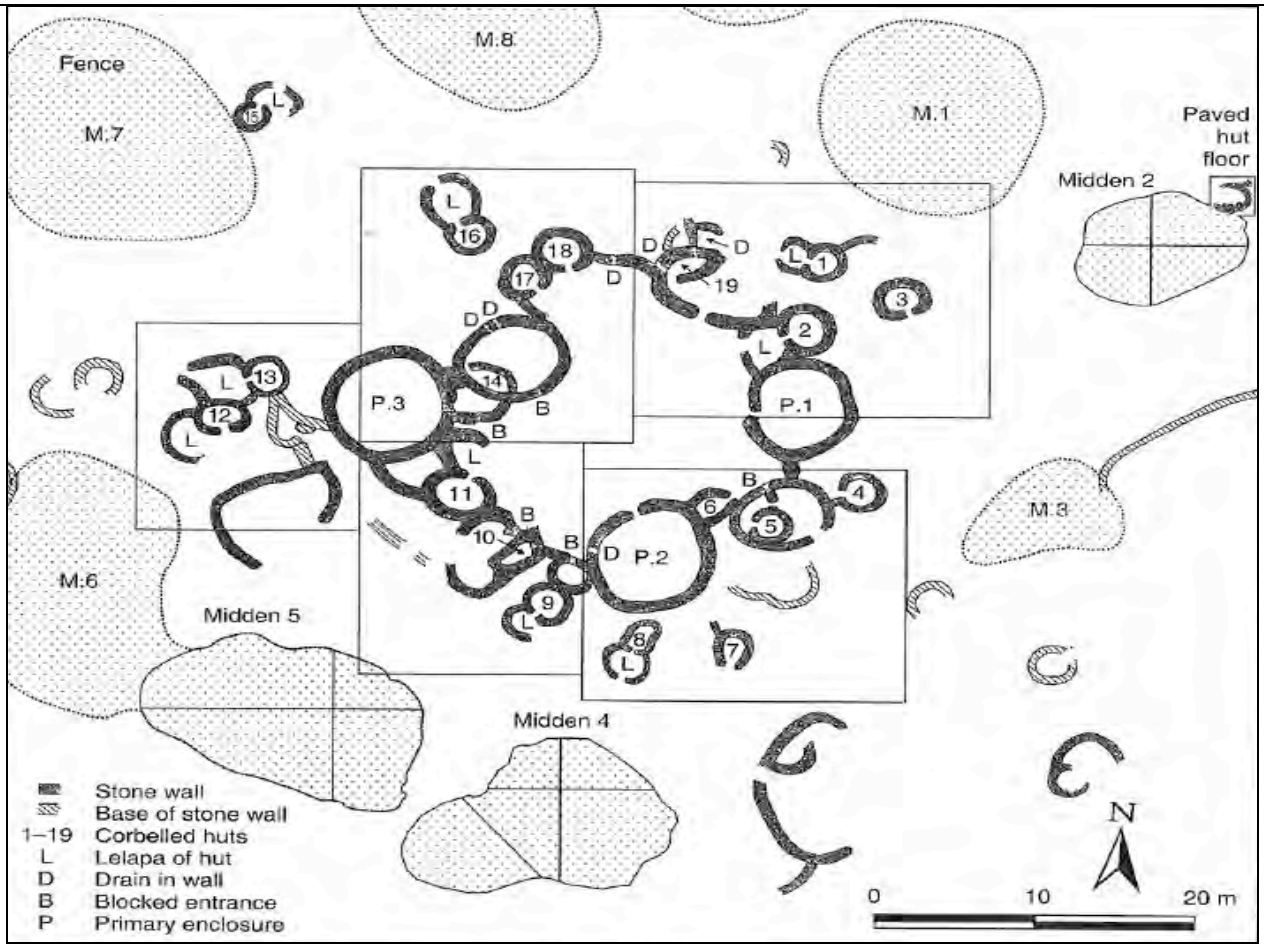

Figure 8 – Layout of a Type V Settlement (Huffman, 2007:38).

1820s	Across the Southern Highveld this period was characterised by warfare and unrest. Known as the Mfecane, these years of upheaval originated primarily in the migration of three Nguni groups from present day Kwazulu-Natal into the present day Free State as a result of the conquests of the Zulu under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi. In c. 1821 the Hlubi migrated across the Drakensberg Mountains in a westerly direction (Maggs, 1976) and attacked the Tlokwa of MaNthatisi along the banks of the Wilge River. This river has its source near Harrismith and flows into the Vaal River where the Vaal Dam is located today. While it is not exactly certain where MaNthatisi's settlements would have been located (in all

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	likelihood further south), the Tlokwa fled westward as a result of the Hlubi attack and in turn attacked other groups in its path. This started a period of unrest and warfare, which rippled across the Highveld on both sides of the Vaal River (Legassick, 2010) (Lye and Murray, 1980). The Ngwane followed closely on the Hlubi and further augmented the unrest and warfare along the southern Highveld (Legassick, 2010). Although the effects of the migrations of the Hlubi and Ngwane would certainly have had a profound impact on the northern Free State as well, this was also the case in terms of the Khumalo Ndebele who would have played a significant role in the surroundings of the study area during this time. The Khumalo Ndebele (also known as the Matabele) were also forced to leave Kwazulu-Natal and between 1823 and 1827 settled along the central Vaal River (Bergh, 1999). Mzilikazi attacked a number of Sotho-Tswana groups and settlements and incorporated them into his kingdom. As a result, his activities would have had a definite impact on the northern Free State at the time.

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Figure 9

King Mzilikazi of the Matabele. This illustration was made by Captain Cornwallis Harris in c. 1838 (www.sahistory.org.za).

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The Early Colonial Period	
The early Colonial Period within the study area and surroundings was characterised by the arrival of newcomers to the Transoraniga. The first arrivals were the Griqua followed by white Trekboers, who for the most part practiced a nomadic pastoralist way of life and were small in number. During the 1830s a mass migration of roughly 2 540 Afrikaner families (comprising approximately 12 000 individuals) from the frontier zone of the Cape Colony to the interior of Southern Africa took place. The people who took part in this Great Trek were later to be known as Voortrekkers (Visagie, 2011).	
1804	The Griqua were of European and Khoikhoi descent, and although they had been present on the Orange River for some time, they only established themselves permanently north of the Orange River in 1804, when they settled at Klaarwater, between present-day Danielskuil and Prieska (Reader's Digest, 1994).
Early 1800s	During the early 1800s, frequent droughts forced white farmers from the Cape Colony to move with their livestock across the Orange River to look for better grazing. Initially, these Trekboers first obtained permission from the Cape authorities before departing across the frontier, however with time, increasing numbers of Trekboers moved across this river into the Transorangia (as it became known) without any prior permission (Schoeman, 1980).

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Early 1836	The first Voortrekker party of some 70 wagons crossed over the Orange River during early 1836. More groups followed and in terms of the surroundings of the study area, established themselves along the Vet River (Schoeman, 1980). Meintjies (1973) mentions that a Voortrekker party under Hendrik Potgieter arrived along the Vet River during this time. As the grazing around the Vet River was not enough for all the livestock and animals of the Voortrekkers, they split up into smaller groups with one group establishing itself in May 1836 at Blaaudrift, on the Zand River. This farm is located within the study area. Apart from this historic event, the closest known tangible evidence for the Voortrekkers to the study area was a fort which they built on the northern bank of the Zand River on the farm Du Preez Leger. It is not known whether remains of this fort still exists. The farm Du Preez Leger is located 1.7 km east of the present study area.
1837 - 1843	In 1841 the town of Winburg was established on the banks of the Vet river. After the annexation of Natal by the British in 1843 and the subsequent dissolution of the Voortrekker Republic of Natalia, Winburg became the capital of the Voortrekkers in what is today known as the Free State (Erasmus, 2004). Winburg is located 34 km south-east of the study area.

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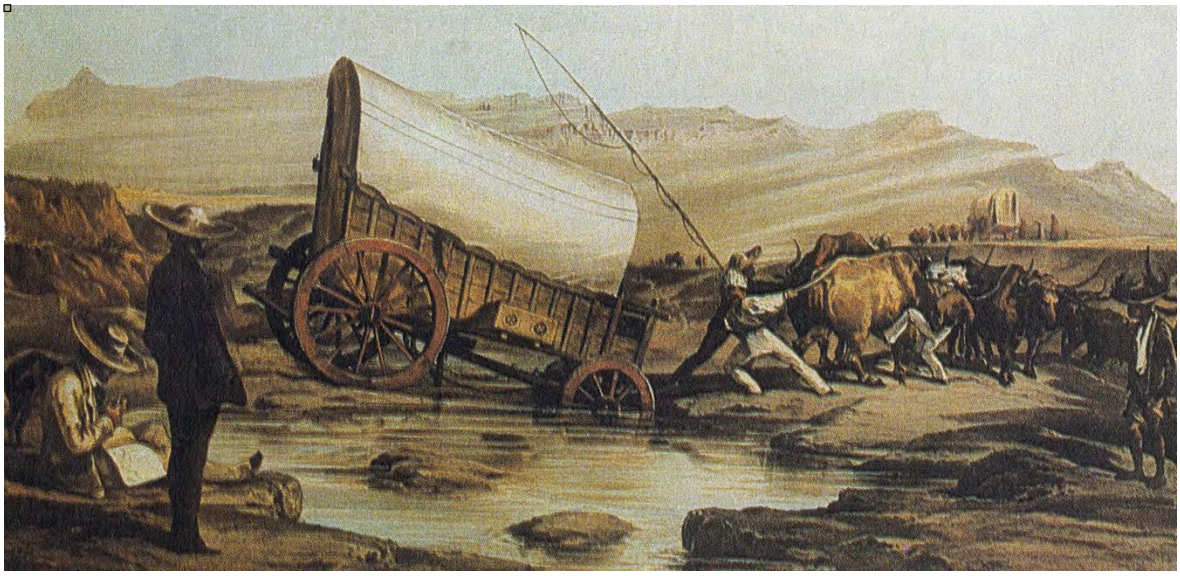

Figure 10 – Depiction of an oxwagon crossing a river during the Great Trek (Reader's Digest, 1994:116).

The Mid to Late Ninteenth Century	
3 February 1848	The Orange River Sovereignity was proclaimed over the Transorangia by Great Britain and had its capital at the newly established Bloemfontein (www.wikipedia.org). The sovereignity came about after one-sided agreements (favouring the British) had been reached by Great Britian with King Moshesh of the Basotho and Adam Kok III of the Griqua. The Voortrekkers present in the Transorangia were completely by-passed by these agreements, which led to serious dismay and disappointment amongst them. In terms of the surroundings of the study area, the response of the Voortrekkers was to force the British magistrate at Winburg, Thomas Biddulph, out of town and proclaim the Republic of Winburg (Reader's Digest, 1994).

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16 January 1852	On this day the Sand River Convention was signed between the British Government, represented by British Assistant Commissioners W.S. Hogge and C.M. Owen, and the Transvaal Boers under the leadership of General Andries Pretorius. This convention formally recognised the existence and independance of the Boer Republic north of the Vaal River by the British Government, and was the foundation for the creation of the *Zuid-Afrikaansche Republiek* (South African Republic) (Oberholster, 1972). The site where the signing of the convention took place, was declared a monument and for many years was marked by a stone cairn and plaque (Oberholster, 1972). The present condition of the monument is not known. The site is located near the bridge where the N1 highway passes over the Sand River, and is located approximately 29 km east of the present study area.
23 February 1854	The Orange River Convention (sometimes referred to as the Bloemfontein Convention) was signed by representatives of Great Britain and the Boers, and resulted in the proclamation of the Boer Republic of the Orange Free State. The convention was signed at Bloemfontein (www.wikipedia.org). As with the proclamation of the Soverignity, the Orange River Convention was again one-sided and did not obtain the blessing or inputs of all the major role-players in the Free State. In 1848 the Voorttrekkers were omitted, whereas in 1854 it was the Basotho and Griqua. For the next 48 years the study area fell within the boundaries of the Boer Republic of the Orange Free State.

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Early 1890s	During the early 1890s the railway line between Bloemfontein and Johannesburg was built, and eventually reached Johannesburg during September 1891 and Pretoria in January 1892 (Schoeman, 1980). In terms of the study area, this railway line passed to its east and in this area was built from Smaldeel (present day Theunissen) to Theron, Welgelegen and Virginia.
9 November 1892 - 1899	The Driekopjes Diamond Mining Company was registered. One of the founding directors of the company was the man who would become synomynous with South African diamond mining and diamonds, Sir Thomas Major Cullinan. The "Driekopjes" in the name of the company referred to a farm of that name north-west of Kroonstad, where diamond mining was taking place. In June 1894 the Driekopjes Diamond Mining Company also acquired an interest in the farm Welgegund from the Van Rensburg Diamond Mining Syndicate. The farm Welgegund was located within the study area, and is presently known as the farm Driekoppies 422. No information could be found on this syndicate. However, the fact that the Driekopjes Company acquired an interest from the Van Rensburg syndicate, suggests that diamond prospecting and possibly mining activities had taken place within the study area before this transfer took place. A large number of diamonds were subsequently recovered from Welgegund, however all mining activities came to a halt with the South African War (1899 – 1902) (Helme, 1974).

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Mid 1890s	During the mid 1890s two men arrived on the farm Aandenk to undertake prospecting work. Alexander Edward King Donaldson was a prospector and his associate Herbert Hinds an engineer. They excavated an 18-meter-deep shaft and took samples from their excavations for further testing and analysis. On their return journey to England, both men died when their ship, the Drummond Castle, wrecked at Ushant off France, and with it the samples they had brought from the Free State (www.sahra.org.za) (Felstar Publishers, 1968). The activities of these two men laid the foundation for the discovery and development of the Free State Goldfields. The farm Aandenk is located immediately south of Allanridge today, some 35 km north by north-west of the present study area.
1899	The town of Odendaalsrust was officially established in 1899 when the Dutch Reformed Church chose the farm Kalkkuil for its new parish. The town was proclaimed a municipality in 1912. At the time, it only had about 40 houses, three shops and a hotel (Mayhew, 1982).
The South African War (1899 – 1902)	
The South African War was fought between the Boer Republics of the Transvaal and Free State on the one side and the Great Britain on the other, but is referred to as the South African War as the victims and participants of the war were not excluded to British or Boer alone. As will be discussed in more detail below, the march of Lord Roberts from Bloemfontein to Pretoria in May and June 1900 was especially significant in terms of the study area. In particular, the so-called Battle of Zand River (7 – 10 May 1900) was fought very close to the study area, with at least the movement of troops during the battle taking place across the study area.	
13 March 1900 – 6 May 1900	Bloemfontein, the capital of the Boer Republic of the Orange Free, was occupied by the British Army under Lord Roberts on 13 March 1900. The Boer Republic of the Orange Free State was renamed the Orange River Colony. With the Republican forces of the Transvaal and Free State retreating

	northwards from Bloemfontein, Lord Roberts's eyes drifted further north, where the greatest prize of the war lay waiting, Pretoria. Lord Roberts and his staff strongly believed that once the capital of the *Zuid-Afrikaansche Republiek* fell, the war would be over. However, the success of the British Army required all focus on the immediate front, as the land between Bloemfontein and Pretoria was bisected by a myriad of rivers, dongas and hills, all strategically significant obstacles from where the Boer forces could implement a solid defence. The Boer forces standing between Lord Roberts and Transvaal capital was estimated by British Intelligence to comprise two main groups namely a force of between 5 000 to 6 000 burghers with 18 guns under General Louis Botha and a similarly large force in the surroundings of Kroonstad (Maurice & Grant, 1906). After departing from Bloemfontein, Lord Roberts's force was involved in a couple of successful actions on their way to Pretoria, including Brandfort (3 May 1900) and Vet River (4 - 6 May 1900). With the successful conclusion of the battle of Vet River, Lord Robers and almost his entire army crossed over the river successfully, and by the evening of 6 May 1900 bivouacked at the small railway siding known as Smaldeel. The town of Theunissen is located here today and is roughly 12 km south of the present study area (Maurice & Grant, 1906). A short distance to the north lay the next, and far more daunting, obstacle on Lord Roberts's march to Pretoria, the Zand (or Sand) River. It was here, at this river, that General Louis Botha, the commanders-in chief of the Transvaal republican forces, had decided to halt Lord Roberts's progress to Pretoria.

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Figure 11 – Lord Frederick Sleigh Roberts (left) and General Louis Botha (right). These two officers commanded the opposing forces at the Battle of Zand River (Changuion, 2001:77 & 117).

7 – 10 May 1900	On 7 May 1900 a reconnaissance of the Zand River by General Edward Hutton indicated that the northern bank of the river was held by a force of roughly 6 000 Boers supported by two heavy and eight light pieces of artillery. These estimates provided by General Hutton allowed Lord Robers to draw up a battle plan (Maurice & Grant, 1906). On the 9th of May 1900, Lord Roberts moved his army forward and established his headquarters at the Welgelegen Station, roughly 6 km east of the study area. The movement of the British Army under Lord Roberts from a position a short distance south of the study area at Smaldeel to a position a short distance east of it, suggests that the main component of Lord Roberts's force followed the railway line and in this way skirted around the study area. However, in view of the

	closeness of this railway line to the present study area, sections of his force would almost certainly have crossed over the study area as well. Lord Roberts's battle plan focussed on securing significant drifts that provides safe crossing of his infantry over the Zand River, and especially so Junction Drift (23.5 km east of the study area), Merriespruit (16.6 km east of the study area), Du Preez Leger Drift (located within the study area where the bridge on the road between Theunissen and Welkom crosses the river) and De Klerks Kraal Drift (940 m west of the present study area). For the purposes of this discussion, the events associated with the latter two of these drifts will be discussed in more detail below. On the morning of 9 May 1900, Lieutenant-Colonel Thomas William Porter with the 1s Cavalry Brigade departed from Smaldeel to reconnoitre the two drifts at Du Preez Leger and De Klerks Kraal. They were assisted in this task by Major-General J.B.B. Dickson with the 4th Cavalry Brigade. Meanwhile, at 11 am, Major-General John French with his advance guard reached Kalkoenkrans, a section of whicn farm is located within the present study area. At Kalkoenrkans, French received word from the reconnaissance units on the river that the Du Preez Leger Drift was not held by the enemy. Seizing the opportunity to outflank the Boer positions, French immediately ordered a squadron of the Scots Greys forward to take possession of the drift, and ordered the remainder of the 1st Cavalry Brigade to follow and assist in this task. The 4th Cavalry Brigade was left at Kalkoenkrans in support. By 15h30 that afternoon the Du Preez Leger Drift was occupied by the British force, with the De Klerks Kraal Drift was taken shortly thereafter. Incidentally, the other significant drifts on the river

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had also been taken with similar ease.

On the morning of 10 May 1900, Lord Roberts's army advanced on the river. On its left flank (and the side closest to the study area) General French with the 1st Cavalry Brigade, the 4th Cavalry Brigade as well as Hutton's Mounted Infantry, crossed over the Du Preez Leger Drift from where they moved in a north-eastern direction.

On the left centre of the front, the 3rd Cavalry Brigade and Henry's Mounted Infantry crossed over the drift at the railway line in proximity to present-day Virginia, some 16.6 km to the east of the study area. The northern bank was occupied by 8 am that same morning.

The crossing of the drifts further to the east was achieved with more difficulty, but the northern banks were also occupied a mere half an hour after the crossing over the Merriespruit Drift near the railway line.

This meant that Lord Roberts's front comprising cavalry and mounted infantry units had successfully crossed over the Zand River early on the morning of 10 May 1900, without meeting any significant resistance. However, the fortunes of war were about to change for Lord Roberts.

A patrol sent out by General French ran into a large Boer force of between 2 000 and 3 000 burghers moving down onto the centre of Lord Roberts's front at the Virginia Station. French ordered an attack by one squadron each from the 6th Inniskilling Dragoons, Scots Greys and Australian Horse and two troops from the 6th Dragoon Guards (Carabiniers). Their attack was focussed on the centre of the advancing Boer force on a ridge located on the farm Vredes Verdrag. This farm is situated some 21.3 km north-east of the present study area and as a result this part of the battle

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will not be discussed in any detail. Suffice to say that the battle raged for some time and the outcome was not at all clear until 14h00 that afternoon when the Boers abandoned the field of battle, allowing the British to occupy the ridge and proceed forward (Maurice & Grant, 1906).

Further battles and actions took place to the east, near Junction Drift. However, by the afternoon of 10 May 1900, all the drifts had been successfully cleared and occupied to allow for the crossing of the Zand River by Lord Roberts's infantry (Maurice & Grant, 1906).

Figure 12 – Two of the British officers at the Battle of the Zand River who were closely associated with the events within the study area, namely the occupation of the Du Preez Leger Drift on 9 May 1900 as well as the crossing of the drift on the morning of 10 May 1900. General John French (left) (Changuion, 2001:77) and Colonel Thomas William Porter (www.nzetc.victoria.ac.nz).

Figure 13 – Lord Roberts's infantry crossing the Zand River at the conclusion of the Battle of Zand River. This photograph was in all likelihood taken during the afternoon of 10 May 1900, after all the significant drifts across the river had been cleared by the cavalry and other units. The crossing and surrounding landscape are monitored by an observation balloon (see top right). It is not possible to identify the exact drift where this crossing took place, although the remnants of a bridge foundation structure can be seen in the river bed. In the back, rows of mule drawn wagons transporting supplies and ammunition can be seen (Raath, 2007:351).

1900 - 1902	After the fall of Pretoria on 5 June 1900 and the subsequent battles of Diamond Hill (11-12 June 1900) and Bergendal (21-27 August 1900), the Boer generals decided that the only way to proceed with the war would be the implement of a completely different strategy, a strategy that is based on a very mobile war by using smaller commandos to attack and harass the British on all fronts in what was to become known as guerrilla warfare. This style of warfare had significant successes, and extended the war for nearly another two years.

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1900 – 1902 (Continued)	No skirmishes or battles associated with the guerrilla war are known from within the study area or its immediate surroundings. This said, the study area and surroundings, as with almost the entire South Africa, experienced the effects of guerrilla warfare. In retaliation to the new form of warfare, the British High Command devised a strategy of building extensive blockhouse lines across the country as a way of hindering the mobility of the Boer commandoes. Lord Kitchener, in particular, also implemented a strategy that was to become known as scorched earth whereby the Boer farms were burnt to the ground and the civilian population (both white and black) remaining on these farms forced into concentration camps. Untold hardship ensued in these camps, and many women and children died as a result of exposure, inadequate nutrition and poor medical facilities. While no concentration camps existed within the study area, a surprising large number of such camps were located in the surroundings of the study area. Black concentration camps were located at Smaldeel, Virginia, Welgelegen and Winburg (Warwick, 1983). Of these, Welgelegen is the closest at a distance of 6 km east of the present study area. The closest white concentration camp to the study area was at Winburg, roughly 34 km south-east of the study area (www.angloboerwar.com).
The Early Twentieth Century (1902 – 1913)	

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October 1902 – November 1904	In October 1902, some months after the end of the South African War, the name of the Driekopjes Diamond Mining Company was changed to the New Driekopjes Diamond Mining Company, which still had Thomas Major Cullinan as one of its directors. Although work at the Driekopjes Mine north-west of Kroonstad resumed on a small scale during 1903 (in all likelihood work at Welgegund also continued), all work at the mine was permanently halted by November 1904. This was due to disappointing yields and as a result the company was liquidated shortly thereafter (Helme, 1974).

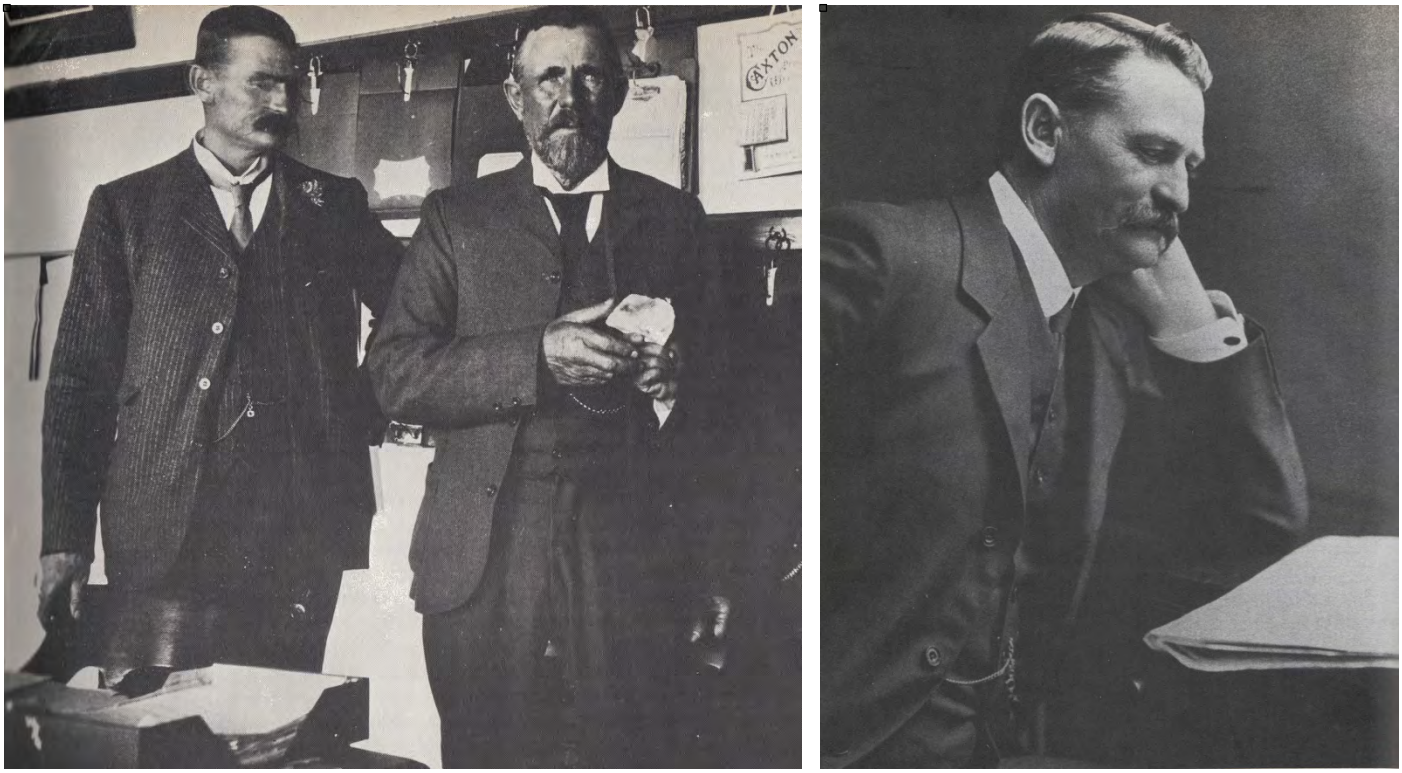

Figure 14 – Sir Thomas Major Cullinan was one of the founding directors of the Driekopjes Diamond Mining Company, which acquired an interest in the farm Welgegund in 1894. In the historic photograph on the left he is shown shortly after the discovery of the Cullinan diamond (which is held by F. Wells) at the Premier Diamond Mining Company, of which he was the chairman. The photograph on the right depicts Cullinan in 1929 (Helme, 1974: 75 & 146).

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1904	After the South African War, renewed efforts were made to carry out gold prospecting work in the area. In 1904, a prospector named Archibald Megson arrived on the farm Aandenk, and the farmer showed him the trench where Donaldson and Hind had looked for gold. Megson opened up the old trench and continued with the excavations. At a depth of 30 meters he found indications of gold and took a number of samples. Megson returned to Johannesburg with his samples and attempted to gain the interest of various mining houses and investors on the rand. However, with the rapid development and expansion of the Witwatersrand gold mining industry attracting all of the attention, no one seemed interested in possibile gold discoveries so far away from Johannesburg (www.sahra.org.za).

Figure 15 – Archibald Megson standing in the prospecting trench on the farm Aandenk (Felstar Publications, 1968).

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1910	At the time, the Driekoppies Diamond Mine at Welgegund comprised 50 claims (Johnson, 1910). Although no detailed information on these syndicates and companies could be obtained, it would appear that by this time the farm was prospected and mined by at least the Magnus Diamond Syndicate Limited as well as the Triumph Diamond Mining Company Limited. Based on this information, it would appear that the Magnus and Triumph entities in all likelihood took over at Welgegund after the liquidation of the New Driekopjes Mining Company in 1904.
25 November 1911	The Drie Koppie Diamond Mine Limited was formed on 25 November 1911 by W.G. Griffiths to acquire from the Magnus Diamond Syndicate Limited and the Triumph Diamond Mining Company Limited the farm Welgegund in the Winburg District (The Mining Manual and Mining Year Book, 1914). The later history of the diamond mine and mining activities at Welgegund could not be revealed by way of the desktop study. However, based on the remains of the mine property observed during the field, it would appear that a diamond mine was operated here into the relatively recent past.
The Boer Rebellion (1914 – 1918)	
At the end of the South African War (1899 – 1902), the Transvaal and Orange Free State republics lost their independence to the British Empire. In 1910 the Union of South Africa was established consisting of the Cape Colony, Natal, the Transvaal Colony and the Orange River Colony. General Louis Botha was appointed the Union's first prime minister and believed that South Africa's future would be best served as apart of the British Commonwealth. In 1914, the South African government under General Louis Botha decided to assist Great Britain in its war with Germany. A number of Boer leaders were not happy about this turn of events, and when General Koos de la Rey was killed at a roadblock in Johannesburg, emotions reached a boiling point and rebellion broke out across the former Boer republics. This rebellion saw more than 11 000 Boer men under the leadership of some of the former Boer War generals such as De Wet, Maritz, Kemp and Beyers, rebelling against the South African government and its armed forces under the leadership of former Boer War generals Louis Botha and Jan Smuts.	
16 November 1914	In terms of the study area, the most notable event relating to the Boer Rebellion was the battle which occurred between the commando of General De Wet and the Government

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	forces under the command of Colonel Enslin at the Virginia railway station on 16 November 1914. This battle followed on the defeat of De Wet's rebels at Mushroom Valley, south-east of Winburg, at the hands of General Louis Botha. De Wet and 2 000 rebels managed to escape from Mushroom Valley and followed the railway line north-eastwards towards the Virginia Station on the Zand River. De Wet wanted to cross over the railway line, and as a result a fight ensued with Colonel Enslin's forces stationed at Virginia Station. General De Wet suffered a number of casualties and 50 of his men were also taken prisoner. After the battle, De Wet and his men followed the Zand River in a western direction and crossed over the river into the Transvaal Colony in proximity to Hoopstad (Union of South Africa, 1916). The Virginia Station is located 16.6 km east of the study area, and as a result the battle would have taken place outside the study area boundaries. However, the movement of De Wet and his commando along the Zand River after the battle would have been through the study area.

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Figure 16 –The hardships experienced by General C.R. de Wet during the rebellion can be seen on these photographs. The one on the left shows De Wet shortly after the South African War (Van Schoor, 2007) with the image on the right depicting the general in the Bloemfontein prison after his capture late in 1914 (Raath & Langner, 2014:119).

The Remainder of the Twentieth Century (1915 – Present Day)	
1929 - 1933	Nearly 25 years after finding the first indications of gold on the farm Aandenk, Archibald Megson finally managed to raise the interests of possible inevstors in Johannesburg. In 1929, during a chance encounter with Joseph Freedman, Megson found a more welcoming response. Freedman introduced the prospector to Johannesburg attorney, Emmanuel Jacobson, and his friend Allan Roberts, a dental technician. Despite being interested in what the prospector had to say, it took almost four years before Jacobson, Roberts and Megson travelled to the Free State (Shorten, 1970). Allan Roberts, who was an amateur prospector, was able to trace a conglomerate outcrop all along the farm Aandenk, and incorrectly identified it as part of the Upper Witwatersrand series. The two friends returned to Johannesburg and formed a syndicate comprising themselves, F.L. Marx, Dr. E.B. Woolf, Samuel Potter and Joseph Freedman. Freedman represented the interests of the old prospector Archibald Megson in the syndicate (Shorten, 1970). The syndicate acquired prospecting options on 31 farms in the area and the company Wit. Extensions Limited was established by the syndicate. On 23 October 1933 drilling commenced at a point roughly 80 m from Megson's trench on the same farm Aandenk. However, by February 1935 the drilling work had to be halted due to a lack of funds without any evidence for gold-bearing reefs identified. Many years later it was estimated that if the two friends had only managed to deepen the hole by another 400 feet, they would have become very rich men and the discoverers of the Free State goldfields. Sadly, this was not to be their fate. Allan Roberts died in such poverty in 1939 and his friends had to pay for his funeral whereas Emmanuel Jacobson had to sell all his assets to survive (Shorten, 1970). Today, the town of Allanridge (named after Allan Roberts) and a monument to the west of the road between Welkom and Bothaville are all that is left of the dreams and expectations of these two mining pioneers.

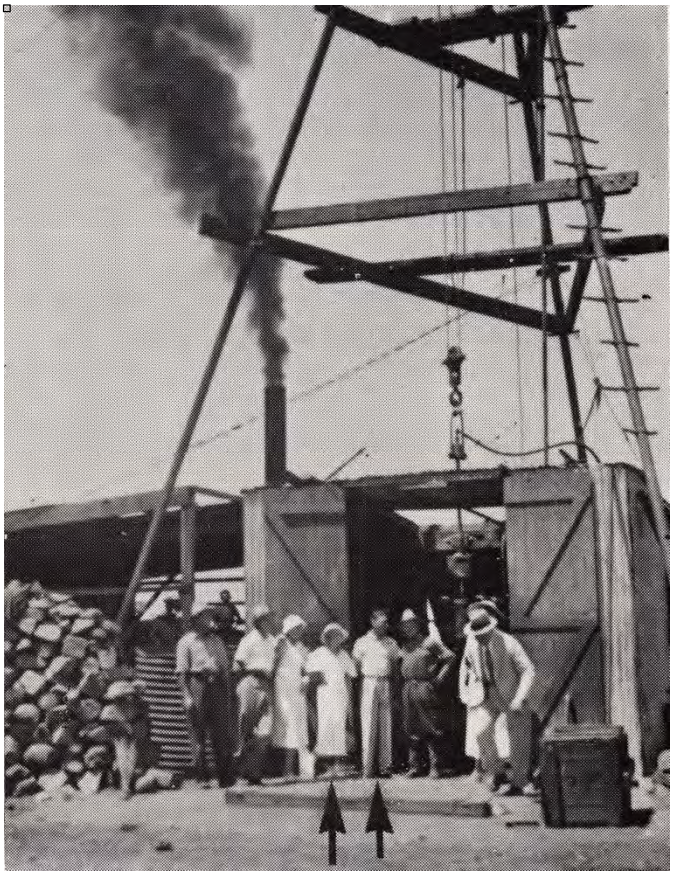

Figure 17 – The first gold prospecting borehole in the Free State was sunk on the farm Aandenk between October 1933 and February 1935. The arrows indicate the positions of Allan Roberts and his wife (Felstar Publications, 1968:11).

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1935	After the failure of Wit. Extensions Limited, an agreement was reached with the Anglo-French Exploration Company to continue prospecting work at Aandenk. However, instead of continuing deeper on the same borehole, the Anglo-French Exploration Company decided to rather deflect the borehole and no results were achieved. It was later estimated that if either one of these companies had deepened the borehole by only another 400 feet, payable gold would have been discovered (Shorten, 1970). The agreement between Wit. Extensions Limited and Anglo-French Exploration Company came to an end and the famous geologist Dr. Hans Merensky acquired an interest in Wit. Extensions Limited. He susbequently carried out extensive prospecting work including the drilling of further boreholes. However, even these more extensive attempts by Merensky to find the Free State goldfields also failed (Shorten, 1970). Machens (2009) indicates that when news broke that the famous discoverer of inter alia South Africa's platinum reserves owned options in a company working on the Free State goldfields, the interest from investors and mining companies to this part of the Free State was further awakened.

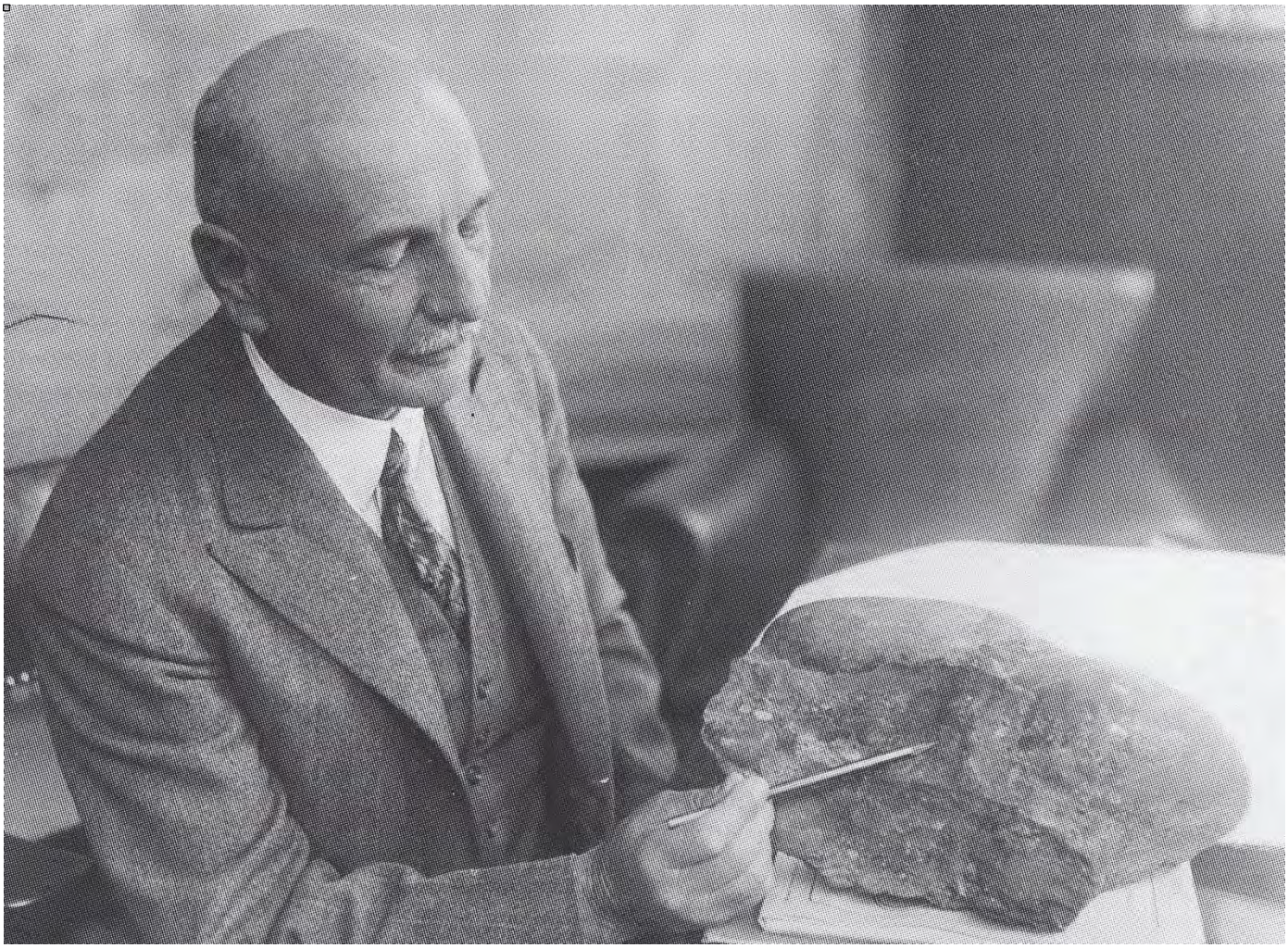

Figure 18 –The famous geologist Dr. Hans Merensky, who had his role to play in the discovery of the Free State goldfields (Machens, 2009).

1 February 1937 – April 1939	After failing to discover any payable gold, Merensky sold his shares in Wit. Extensions to the Anglo American Corporation, who on 1 February 1937 established the West Rand Investment Trust. The trust also carried out an extensive drilling operation. The activities and interest of the Anglo American Corporation in this part of the Free State attracted the interest of other mining houses and investment companies, and prospecting options were taken out on a large number of farms from this area (Shorten, 1970).

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	Despite all this interest, the first payable gold in the Free state was only identified in March 1939 druing drilling operations by the African and European Investment Company on the farm Uitsig at a depth of 2 701 feet (Felstar Publishers, 1968). One month later, during April 1939, another discovery of payable gold was made on the farm St. Helena at a depth of 1 143 feet (Shorten, 1970). The discoveries of payable gold at Uitsig and St. Helena created significant excitement amongst mining companies and investors, and increasing numbers of prospecting options and eventually mines were acquired and developed. The Free State gold rush had begun. The farm Uitsig is located 10.3 km north by north-east of the present study area with the farm St. Helena roughly 2.9 km to the north.
1941	The first gold mining lease in the Free State was granted by the government of the Union of South Africa for the farm St. Helena in 1941, and the St. Helena Gold Mining Company was established to mine and develop the property (Felstar Publishers, 1968). A number of other gold mining companies were also established in a realtively short spate of time, including the Welkom Gold Mining Company, President Steyn Gold Mining Company and the President Brand Gold Mining Company.

Figure 19 –The first mine shaft ever sunk along the Free State goldfields, namely the No. 3 Incline Shaft at the St. Helena Gold Mine (Felstar Publishers, 1968:151).

16 April 1946	The borehole of the Blinkpoort Gold Syndicate Limited on the boundary of the farms Geduld and Friedenheim, reached payable gold in 1946. On 16 April 1946 it was announced that the gold-bearing material retrieved at a depth of 3 922 feet from this borehole assayed at an impressive 1 252 dwts per ton which was unique in the history of golf prospecting and mining in South Africa, with averages usually in the region of 250 dwts per ton. This discovery led to further interest in the Free State goldfields (Felstar Publishers, 1968).
11 July 1946 – 15 April 1947	On 11 July 1946 an application was made by the land company of Sir Ernest Oppenhaimer's Anglo American Corporation, namely the South African Township and Mining and Finance Corporation, for the establishment of a new town called Welkom. After some legal and procedural processes and debate between the township applicants and its opponents (including the Odendaalsrus Town Council), the application for the establishment of the town of Welkom was approved on 15 April 1947 (Felstar Publishers, 1968). William Backhouse designed the town as a garden city with a commercial centre built around a town square and traffic circles rather than stop streets or traffic lights. More than a million trees were also planted (Erasmus 2014).

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Figure 20 –This photograph of Welkom was taken during the 1960s, roughly ten years after its establishment (Felstar Publications, 1968:171).

1953	After gold was discovered in the area, Odendaalsrus became a prominent town in the Free State. A railway line was built from Allanridge to Odendaalsrus in 1953 and served the two Freddies mines (Nienaber et al. 1982).

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1954	Three of the six mines surrounding Welkom had reached production stage by 1954. These were the Welkom, Western Holdings and St. Helena Mines. During the same year the town of Virginia was laid out on the banks of the Zand River. As indicated elsewhere, the name of this town was derived from the nearby railway station, which in turn was named this after two American engineers working on the line in 1890 had carved the name "Virginia" on a boulder from a nearby hill (Erasmus 2014). Virginia is located 16 km east of the present study area.
1981 - 1987	Beisa Shaft (now the Beatrix West Section) was commissioned in 1981 to exploit uranium. The sinking of Beatrix 1 and 2 Shafts (now the Beatrix South Section) were also started at the time (www.sibanyegold.co.za). In 1984, the Beisa Uranium Mine was closed due to the low price of uranium at the time. In 1985 the Beatrix 1 and 2 Shafts were commissioned and exploration work commenced in proximity to the Beisa Mine on the farm Kalkoenkrans (www.sibanyegold.co.za). The sinking of two sub-vertical shafts and a ventilation shaft commenced at the Beisa Mine in 1987. During the same year this mine was renamed the Oryx Mine (www.sibanyegold.co.za). The Beisa (Oryx) Mine is located within the study area on the farm Palmietkuil.

6.2 Heritage Sensitivity as Revealed in the Historical and Archaeological Overview

It is clear that the historical and archaeological overview revealed various aspects relating to the surroundings of the study area. While this assists with reconstructing the historical landscape, it does however provide some indication of the relatively limited historical significance of the study area as a whole. The following historical events and sites can be directly associated with the study area:

- During archaeological research undertaken by the National Museum in Bloemfontein, a total of 10 Middle Stone Age and Later Stone Age sites were identified in association with mammal fossil bones in drainage gulleys along the Vet, Doring and Sand Rivers. It is important to note that this research was not focussed on identifying Stone Age sites without the associated presence of mammal fossil bones. The chances for finding more Stone Age sites along these rivers are therefore high. The prevalence of such sites along the banks of rivers was supported during the fieldwork when a previously unrecorded Middle Stone Age site was identified within the boundaries of the study area on the northern bank of the Sand River (see Site 33).
- The historical and archaeological review has revealed that the study area is located outside of the known distribution of Late Iron Age stonewalled settlements as published by Maggs (1976). This observation is largely supported by the disttibution maps of known Iron Age sites as published by Huffman (2007). This said, it is always still possible for Iron Age sites to be located within the study area, although the chance for this would be low.

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- In May 1836, a Voortrekker party under the leadership of Hendrik Potgieter arrived in the wider surroundings of the study area. Due to limited grazing the party decided to splinter into smaller groups. One of these groups established themselves at the present-day farm Blaauwdrift, located within the study area (Meintjies, 1976).
- Diamond prospecting and mining activities had been undertaken on the farm Welgegund since at least the esarly 1890s. These early activities appear to have been undertaken by the Van Rensburg Diamond Mining Syndicate. In June 1894 an interest in the farm Welgegund was acquired by the Driekopjes Diamond Mining Company, a founding director of which was the famous diamond magnate Sir Thomas Major Cullinan. While mining activities were undertaken in ernest during the remainder of the decade, the outbreak of the South African War in 1899 brought all work to a halt. After the war, mining activies continued at Welgegund. With time other mining companies also acquired claims on the farm, including the Magnus Diamond Mining Company, Triumph Diamond Mining Company, Welgegund Diamond Mining Company as well as the Drie Koppies Diamond Mining Company. This latter company appears to have still existed by 1931. The farm Welgegund was located within the study area, and is presently known as the farm Driekoppies 422.
- The South African War (1899-1902) had a significant impact across the country, and also within the study area. During the Battle of Zand River (7 – 10 May 1900), the most significant drifts across the river were earmarked for attention by Lord Robers in his attack, including the Du Preez Leger Drift as well as De Klerks Kraal Drift. While the latter drift is located outside of the study area, the available land deed information has revealed that the farms Blaauwdrift and Adamson's Vley located within the present study area, were subdivided from the farm Du Preez Leger after the war. It is evident that at the time of the battle, the drift located within the study area on the farm Blaauwdrift, was in fact located on the farm Du Preez Leger. This means that the actions and events associated with this drift during the battle, would have taken place within the study area.
- During the Boer Rebellion (1914 -1915) a battle took place between the commando of General De Wet and government forces under Colonel Enslin at the Virginia railway station on 16 November 1914. While this battle was located some distance east of the study area, it is important to note that after the battle De Wet and his commando followed the Zand River in a westerly direction towards Hoopstad, and as a result crossed through the study area.
- In March and April 1939 and 16 April 1946 significant discoveries of payable gold were made during prospecting drilling operations on the farms Uitsig, St. Helena and Geduld. These discoveries led to the rapid development of the Free State goldfields which significantly changed the entire landscape, including the present study area.
- In 1981 the Beisa Shaft was commissioned. This shaft is located within in the study area, and is where the Beatrix 4 Shaft is still located today.

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7. KNOWN HERITAGE RESOURCES FROM WITHIN THE STUDY AREA

A number of different techniques were used to identify known heritage resources from within the study area. These will be discussed individually below.

7.1 Examination of Archival and Historic Maps

Maps obtained from the Directorate: Surveys and Mapping in Cape Town were used to compile a historic layering of the study area and at the same time also to provide augmentative information to the identified heritage sites. Overlays were made on Google Earth. This allowed for the recording of GPS coordinates for each depicted feature and also to assess the position of these map features in relation to heritage sites identified during the present study.

7.1.1 First Edition of the 2826BA Topographical Sheet

In this section the First Edition of the 2826BA Topographical Sheet will be discussed. This map sheet was based on aerial photography carried out in 1944, was surveyed in 1945 and drawn in the Trigonometrical Survey Office in 1945. The sheet was printed in 1945 by the Government Printer of the Union of South Africa.

As the study area extends over a significant portion of land, the discussion that follows will be done on a section by section basis. Furthermore, it is worth noting that as this map sheet was surveyed in 1945, any buildings or features depicted on it which still exists today will be at least 71 years old.

7.1.1.1 Potential Heritage Sites depicted on the First Edition Map for Section 1

The First Edition of the 2826BA Topographical Sheet depicts a total of seven huts, four building clusters, an old ruin, two bridges, a cattle kraal and two cemeteries within Section 1.

Table 4- List of features depicted on the First Edition Map for Section 1

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 1	Building	S 28.092768 E 26.734639	A cluster of buildings is depicted here. It seems likely that this cluster represents the farmstead for the farm Adamson's Vley.
Feature 2	Cemetery	S 28.093705 E 26.732321	A cemetery is depicted here. During the fieldwork, an historic cemetery comprising 37 graves was identified here. See Site 37.
Feature 3	Hut	S 28.098112 E 26.738170	A single hut is depicted here.

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Feature 4	Hut	S 28.099021 E 26.738355	A single hut is depicted here.
Feature 5	Hut	S 28.100302 E 26.738953	A single hut is depicted here.
Feature 6	Hut	S 28.106835 E 26.726901	A single hut is depicted here.
Feature 7	Hut	S 28.108346 E 26.727508	A single hut is depicted here.
Feature 8	Ruin	S 28.111435 E 26.719133	An old ruin is depicted here.
Feature 9	Hut	S 28.113614 E 26.719164	A single hut is depicted here.
Feature 10	Building	S 28.112944 E 26.727216	A cluster of buildings is depicted here.
Feature 11	Bridge	S 28.112916 E 26.732233	A possible drift over the Zand River is depicted here.
Feature 12	Building	S 28.120587 E 26.722841	A cluster of buildings is depicted here. During the fieldwork, two buildings were identified here (see Sites 40 and 41)
Feature 13	Building	S 28.115985 E 26.716711	A cluster of buildings is depicted here.
Feature 14	Kraal	S 28.116324 E 26.715960	A cattle kraal is depicted here.
Feature 15	Hut	S 28.117306 E 26.714507	A single hut is depicted here.
Feature 101	Cemetery	S 28.098191 E 26.741399	A cemetery is depicted here.
Feature 102	Bridge	S 28.117548 E 26.719603	A bridge is depicted here. This bridge appears to be the concrete low water bridge that was identified in the field (see Site 38).

Please refer to the next page for a section of the 2826BA Topographical Sheet depicting this Section 1.

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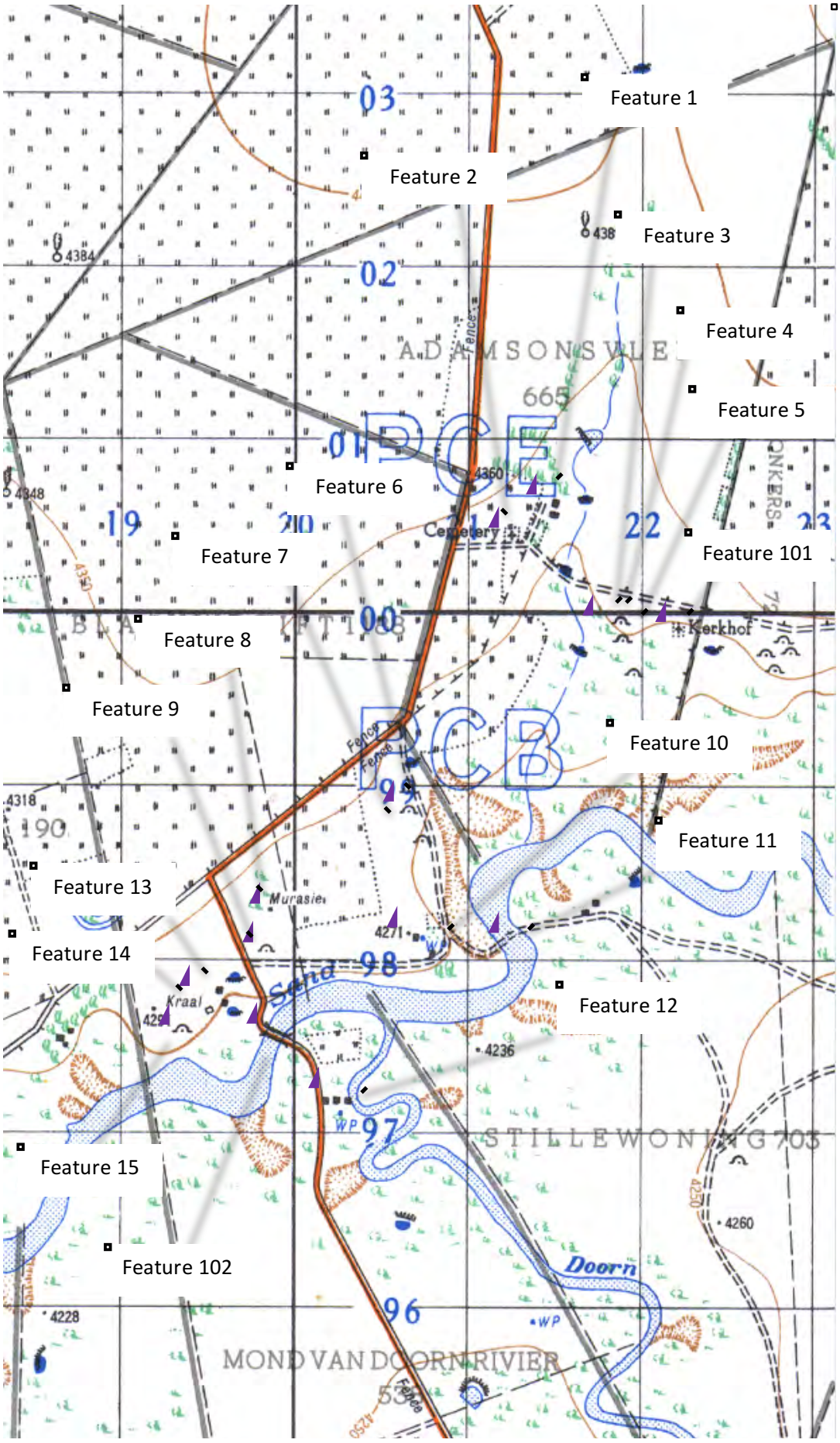

Figure 21 – Detailed view of Section 1 as depicted on the First Edition of the 2826BA Topographical Sheet. The features discussed in the text are marked.

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7.1.1.2 Potential Heritage Sites depicted on the First Edition Map for Section 2

The First Edition of the 2826BA Sheet depicts a total of 13 huts, four building clusters and cattle kraal on Section 2.

Table 5- List of features depicted on the First Edition Map for Section 2

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 16	Building	S 28.145410 E 26.733872	A cluster of buildings is depicted here.
Feature 17	Kraal	S 28.160358 E 26.738236	A cattle kraal is depicted here.
Feature 18	Hut	S 28.161464 E 26.738627	A single hut is depicted here.
Feature 19	Hut	S 28.164301 E 26.735606	A single hut is depicted here.
Feature 20	Hut	S 28.167062 E 26.730062	A single hut is depicted here.
Feature 21	Hut	S 28.167343 E 26.734004	A single hut is depicted here.
Feature 22	Hut	S 28.170620 E 26.733312	A single hut is depicted here.
Feature 23	Hut	S 28.175634 E 26.734129	A single hut is depicted here.
Feature 24	Building	S 28.180803 E 26.730469	A single building is depicted here.
Feature 25	Huts	S 28.178993 E 26.741571	A cluster of seven huts is depicted. These huts may be the staff housing at the Kalkoenkrans farmstead.
Feature 26	Building	S 28.178229 E 26.7415390	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Kalkoenkrans.
Feature 27	Building	S 28.194477 E 26.727305	A cluster of buildings is depicted here.

Please refer to the next page for depiction of Section 2 on the 2826BA Topographical Sheet.

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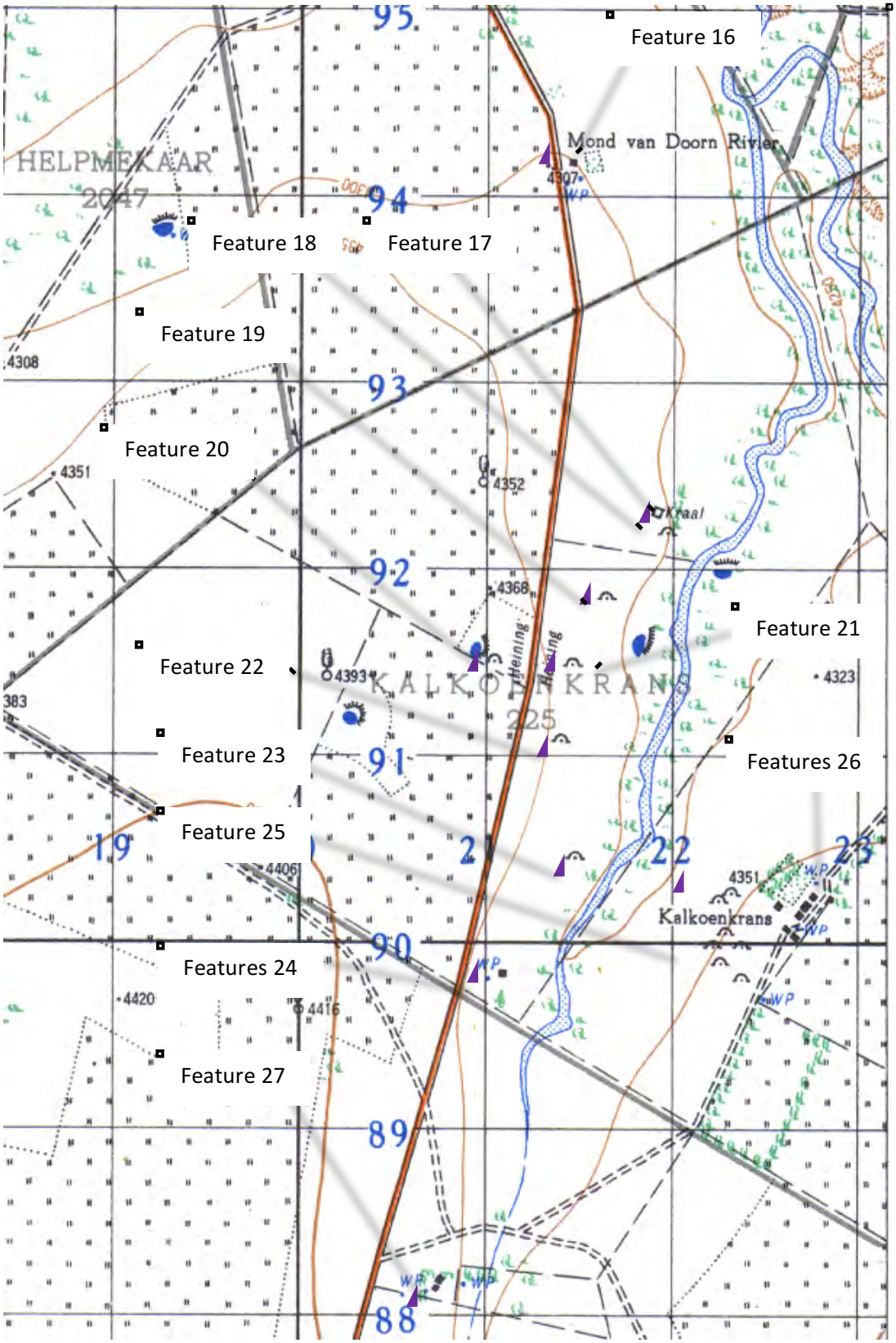

Figure 22 – Detailed view of Section 2 as depicted on the First Edition of the 2826BA Topographical Sheet. The features discussed in the text are marked.

7.1.1.3 Potential Heritage Sites depicted on the First Edition Map for Section 3

The First Edition of the 2826BA Topographical Sheet depicts a total of fifteen huts, six buildings and one building cluster as well as two cattle kraals on Section 3.

Table 6- List of features depicted on the First Edition Map for Section 3

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 28	Hut	S 28.198006 E 26.665681	A single hut is depicted here.
Feature 29	Hut	S 28.197550 E 26.667061	A single hut is depicted here.
Feature 30	Building	S 28.202430 E 26.669582	A building is depicted here. It seems likely that this building represents the farmstead for the farm Damplaats.
Feature 31	Kraal	S 28.205585 E 26.668084	A cattle kraal is depicted here.
Feature 32	Building	S 28.210294 E 26.721340	A single building is depicted here.
Feature 33	Hut	S 28.214558 E 26.717974	A single hut is depicted here.
Feature 34	Hut	S 28.218728 E 26.716487	A single hut is depicted here.
Feature 35	Hut	S 28.224067 E 26.715416	A single hut is depicted here.
Feature 36	Hut	S 28.224803 E 26.718665	A single hut is depicted here.
Feature 37	Hut	S 28.226275 E 26.718271	A single hut is depicted here.
Feature 38	Hut	S 28.222985 E 26.747141	A single hut is depicted here.
Feature 39	Building	S 28.222715 E 26.748116	A single building is depicted here. During the fieldwork, a modified farmhouse was identified here (see Site 20).
Feature 40	Hut	S 28.243258	A single hut is depicted here.

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		E 26.686060	
Feature 41	Building	S 28.246921 E 26.684160	A single building is depicted here.
Feature 42	Building	S 28.250046 E 26.686012	A single building is depicted here.
Feature 43	Hut	S 28.242104 E 26.705535	A single hut is depicted here.
Feature 44	Hut	S 28.241112 E 26.706885	A single hut is depicted here.
Feature 45	Hut	S 28.240158 E 26.707413	A single hut is depicted here.
Feature 46	Hut	S 28.237443 E 26.720856	A single hut is depicted here.
Feature 47	Kraal	S 28.238891 E 26.717918	A cattle kraal is depicted here.
Feature 48	Building	S 28.240114 E 26.717941	A building is depicted here. During the fieldwork, an old wagon shed was identified here (see Site 1B), with an old farmhouse (see Site 1A) nearby.
Feature 49	Building	S 28.245588 E 26.710845	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Boschluis Spruit. During the fieldwork, the remains of a historic farmstead was identified here (see Site 44).

Please refer to the next two pages for components of Section 3 as depicted on the First Edition of the 2826BA Topographical Map.

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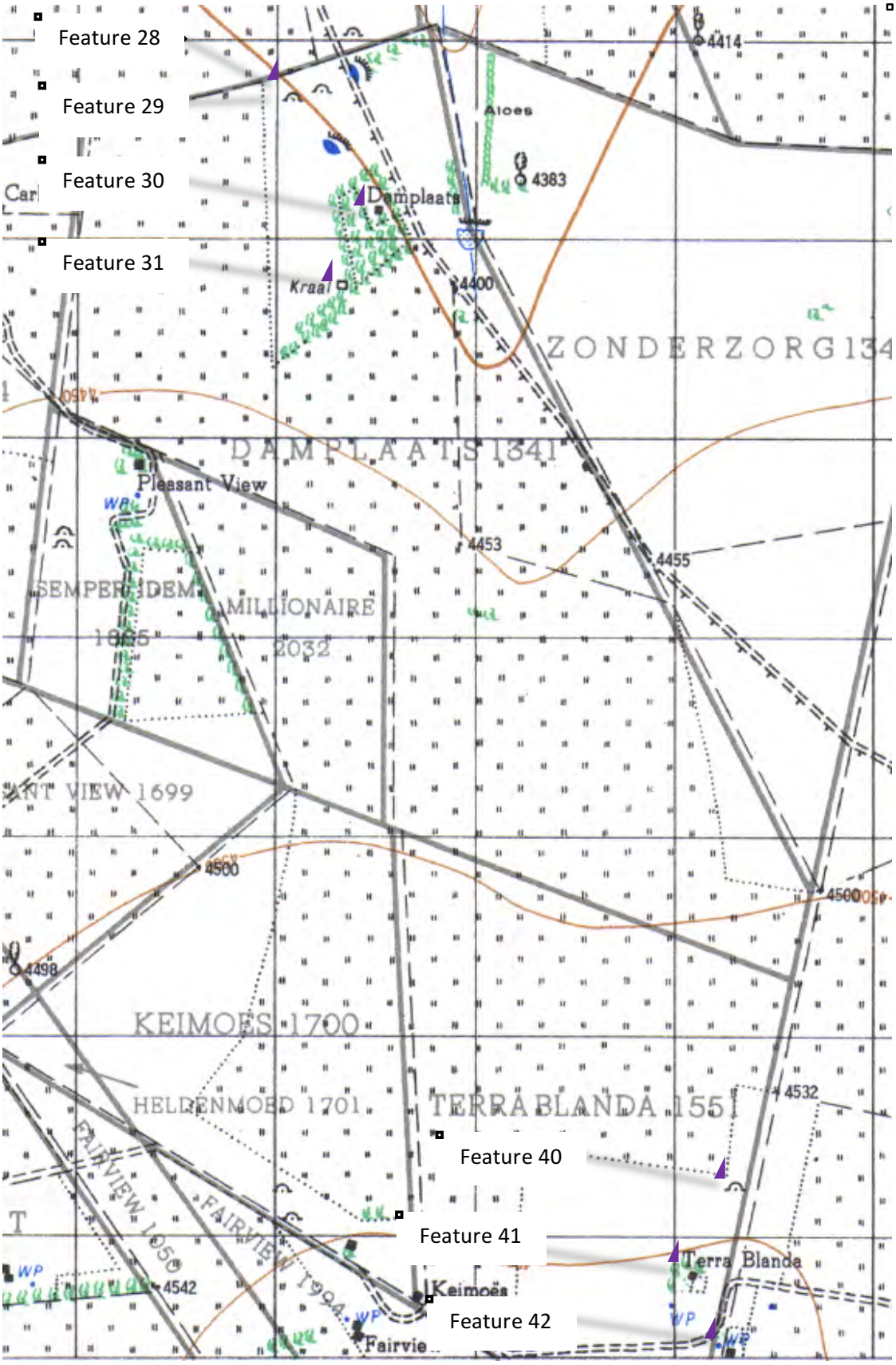

Figure 23 – Detailed view of a component of Section 3 as depicted on the First Edition of the 2826BA Topographical Sheet. The features discussed in the text are marked.

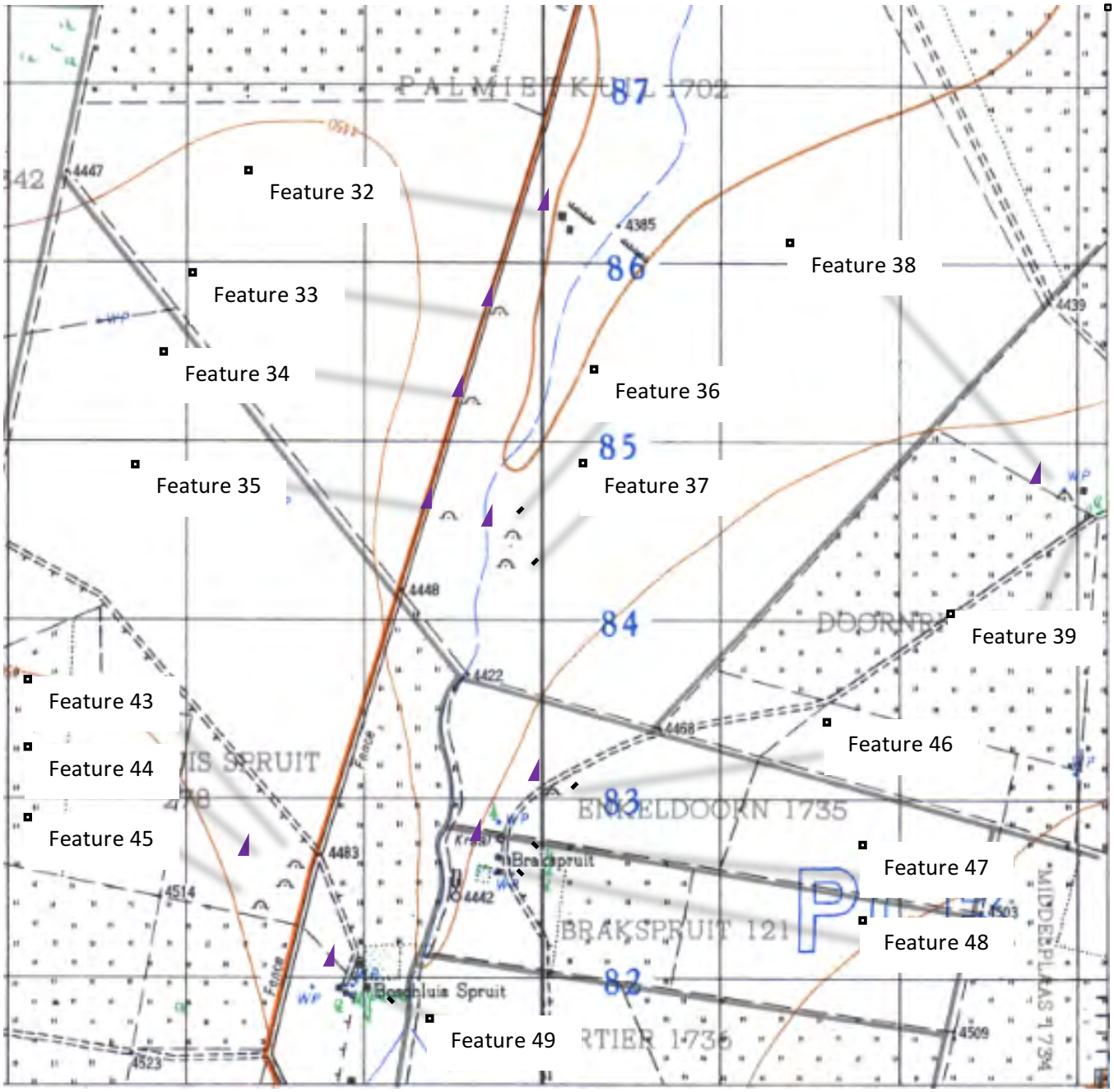

Figure 24 – Detailed view of a component of Section 3 as depicted on the First Edition of the 2826BA Topographical Sheet. The features discussed in the text are marked.

7.1.2 First Edition of the 2826BC Topographical Sheet

In this section the First Edition of the 2826BC Topographical Sheet will be discussed. This map sheet was based on aerial photography carried out in 1947, was surveyed in 1947 and drawn in the Trigonometrical Survey Office in 1951. The sheet was printed in 1951 by the Government Printer of the Union of South Africa.

As the study area extends over a significant portion of land, the discussion that follows will be done on a section by section basis. Furthermore, it is worth noting that as this map sheet was surveyed in 1947, any buildings or features depicted on it which still exists today will be at least 69 years old.

7.1.2.1 Potential Heritage Sites depicted on the First Edition Map for Section 4

The First Edition of the 2826BC Topographical Sheet depicts a total of sixteen huts, eight buildings on Section 4.

Table 7- List of features depicted on the First Edition Map for Section 4

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 50	Building	S 28.273888 E 26.642415	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Retreat. During the fieldwork, an old farmstead (see Site 11) and associated structures and buildings were identified here.
Feature 51	Hut	S 28.270400 E 26.646122	A single hut is depicted here.
Feature 52	Hut	S 28.271178 E 26.646231	A single hut is depicted here.
Feature 53	Hut	S 28.268035 E 26.650623	A single hut is depicted here.
Feature 54	Hut	S 28.273323 E 26.653182	A single hut is depicted here.
Feature 55	Hut	S 28.276510 E 26.653178	A single hut is depicted here.
Feature 56	Hut	S 28.277428 E 26.653723	A single hut is depicted here.
Feature 57	Building	S 28.275384 E 26.670825	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Welgegund.

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Feature 58	Building	S 28.280235 E 26.672822	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Deeldam.
Feature 59	Hut	S 28.272606 E 26.696802	A cluster of huts is depicted here.
Feature 60	Building	S 28.267933 E 26.696345	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the old farmstead for the farm Deeldam. During the fieldwork, two old sheds were identified here (see Site 42).
Feature 61	Hut	S 28.263093 E 26.70225	A cluster of huts is depicted here.
Feature 62	Hut	S 28.262183 E 26.704227	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Tipten. During the fieldwork, an old wagon shed was identified here (see Site 43).
Feature 63	Building	S 28.256324 E 26.683334	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Frischgewaagd. During the fieldwork, the ruins of an old farmstead comprising a dwelling, shed and swimming pool were identified here (see Site 6).
Feature 64	Hut	S 28.253606 E 26.681279	A single hut is depicted here.
Feature 65	Hut	S 28.254465 E 26.680920	A single hut is depicted here.
Feature 66	Hut	S 28.254451 E 26.679446	A single hut is depicted here.
Feature 67	Building	S 28.254644 E 26.742872	A single building is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Middelplaas. During the fieldwork, a section of the foundation remains of an old farmhouse was identified here (see Site 24).
Feature 68	Building	S 28.271901 E 26.741831	A cluster of huts is depicted here. It seems likely that this cluster of huts may have been the staff quarters at the farmstead for the farm Excelsior.
Feature 69	Huts	S 28.272678 E 26.743195	A single building is depicted here. It seems likely that this building was the farmhouse for the farm Excelsior.
Feature 70	Hut	S 28.271136 E 26.745584	A single hut is depicted here.

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Feature 71	Hut	S 28.287915 E 26.747206	A single hut is depicted here.
Feature 72	Hut	S 28.288739 E 26.747501	A single hut is depicted here.
Feature 73	Building	S 28.290430 E 26.743600	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Grotkau. During the fieldwork, the remains of a very old farmhouse (see Site 26) was identified where the northern building is depicted whereas a well preserved farmhouse (see Site 28) was identified where the southern building is depicted on this map.
Feature 103	Mine	S 28.274188 E 26.675897	The old Driekoppies Diamond Mine is located here. According to historic information, diamond mining had already taken place here during the 1890s. During the fieldwork, an old brick building (see Site 4) was identified near the mine workings. Although this building is not depicted on this map, it would have been associated with the same mine as discussed here.

Please refer next page for a section of the 2829BC Topographical Sheet depicting this Section 4.

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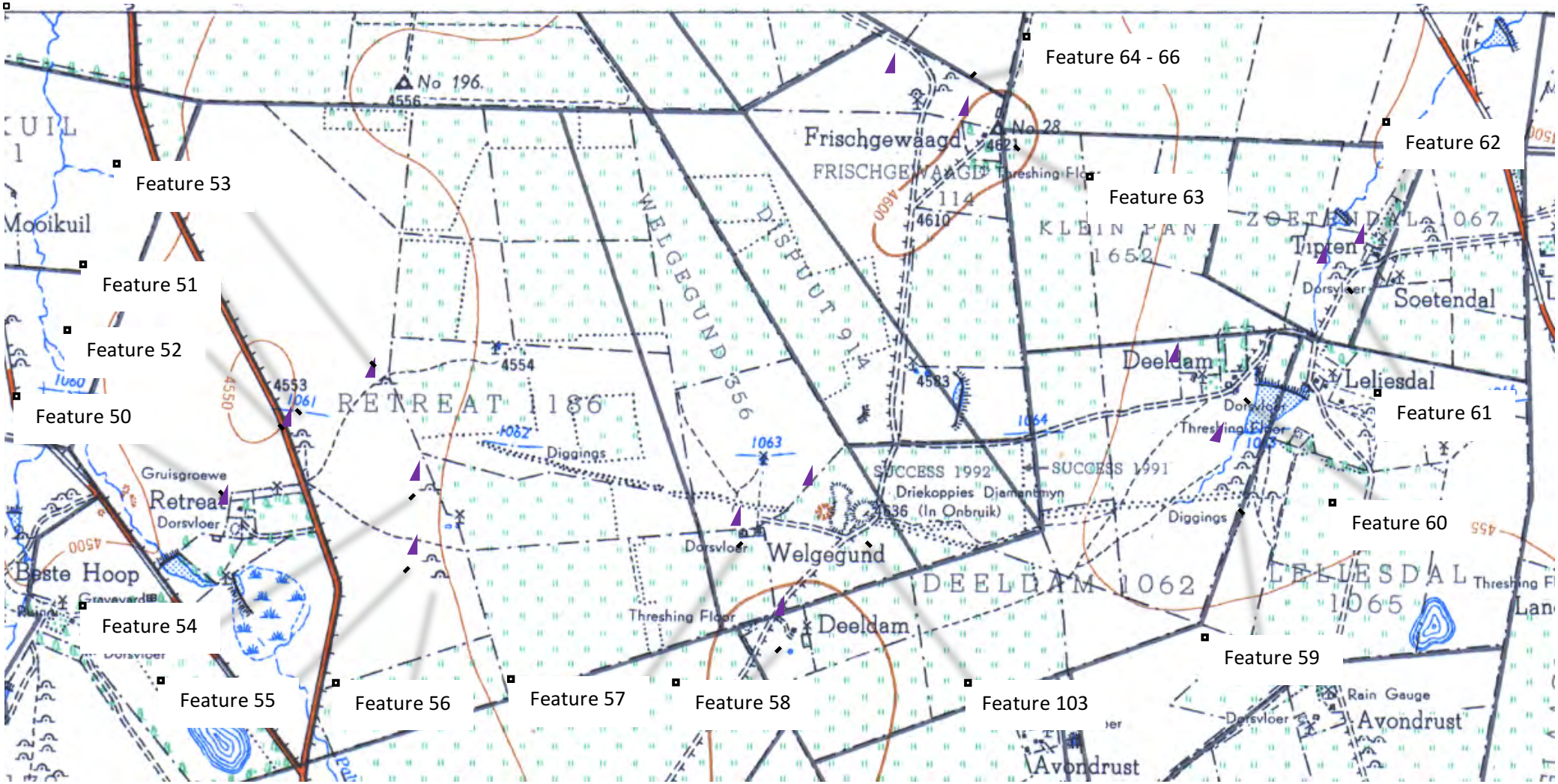

Figure 25 – Detailed view of Section 4 as depicted on the First Edition of the 2826BC Topographical Sheet. The features discussed in the text are marked.

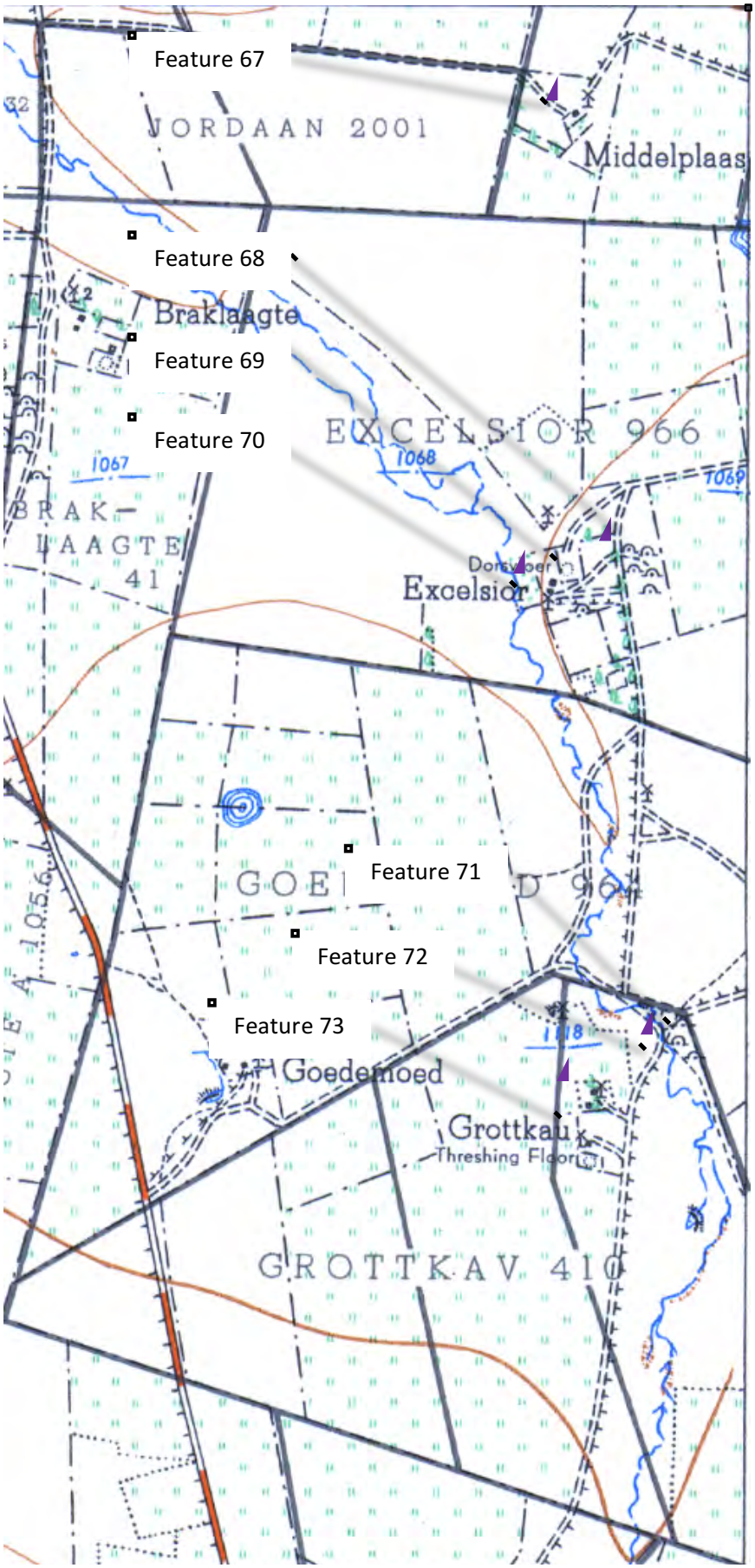

Figure 26 – Detailed view of Section 4 as depicted on the First Edition of the 2826BC Topographical Sheet. The features discussed in the text are marked.

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7.1.3 First Edition of the 2826BD Topographical Sheet

In this section the First Edition of the 2826BD Topographical Sheet will be discussed. This map sheet was based on aerial photography carried out in 1947, was surveyed in 1947 and drawn in the Trigonometrical Survey Office in 1951. The sheet was printed in 1951 by the Government Printer of the Union of South Africa.

As the study area extends over a significant portion of land, the discussion that follows will be done on a section by section basis. Furthermore, it is worth noting that as this map sheet was surveyed in 1947, any buildings or features depicted on it which still exists today will be at least 69 years old.

7.1.3.1 Potential Heritage Sites depicted on the First Edition Map for Section 5

The First Edition of the 2826BD Topographical Sheet depicts a total of six huts (in two different localities) as well as a cluster of the buildings on Section 5.

Table 8- List of features depicted on the First Edition Map for Section 5

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 74	Huts	S 28.280181 E 26.754013	A cluster of five huts is depicted here.
Feature 75	Hut	S 28.281107 E 26.753136	A single hut is depicted here.
Feature 76	Building	S 28.285114 E 26.756337	A cluster of buildings is depicted here. It seems likely that this cluster of buildings represents the farmstead for the farm Goedemoed.

Please refer next page for a section of the 2826BD Topographical Sheet depicting this Section 5.

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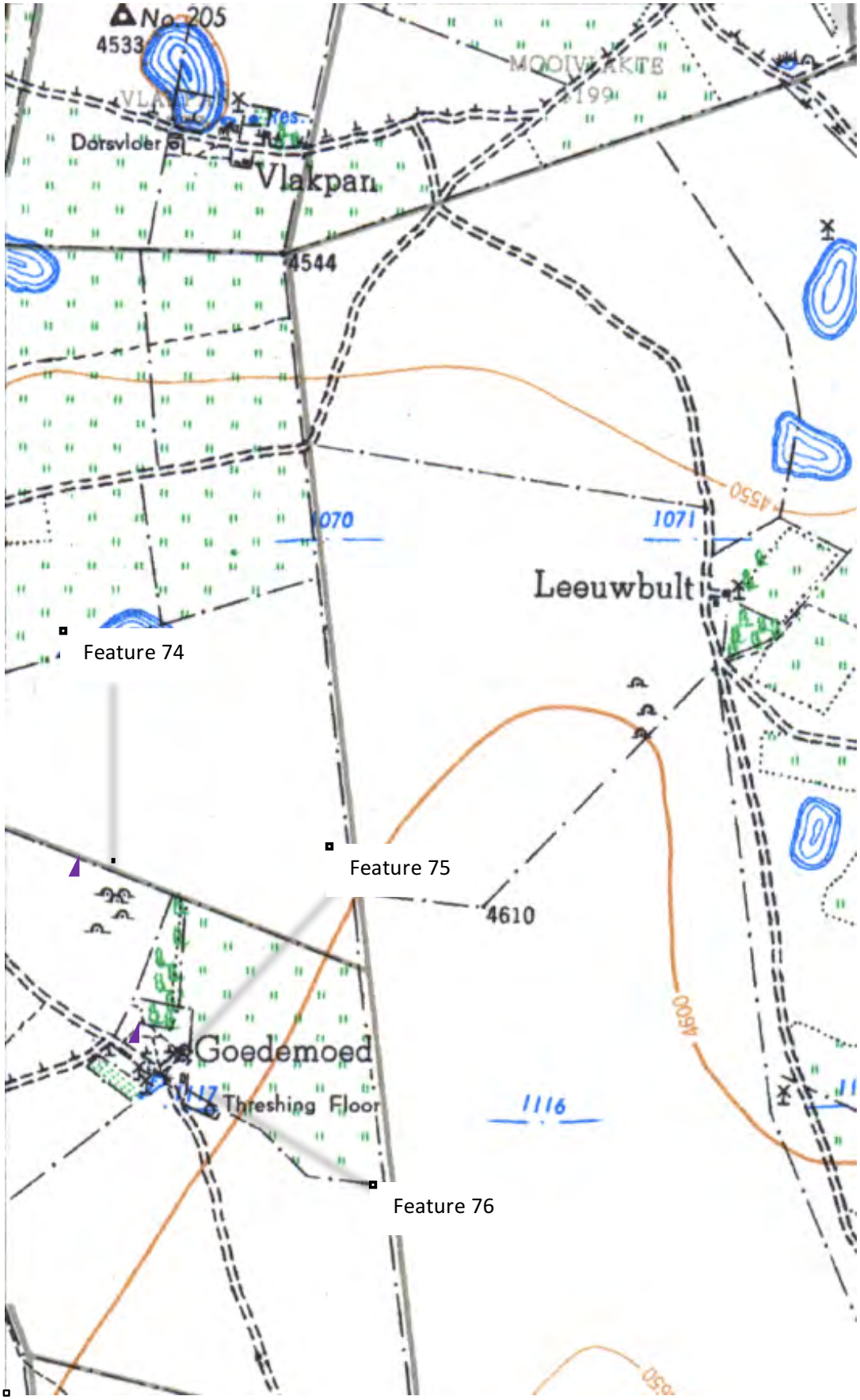

Figure 27 – Detailed view of Section 5 as depicted on the First Edition of the 2826BD Topographical Sheet. The features discussed in the text are marked.

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7.2 Examination of Google Earth Satellite Imagery

An aerial scan was carried out of the study area as depicted on Google Earth satellite images to compare and verify the presence of potential heritage sites, and specifically built structures. As the assessment of especially the First Editions of the 2826BA, 2826BC and 2826BD Topographical Sheets has yielded such a large number of potential sites, the decision was made to focus the Google Earth work solely on identifying abandoned sites and structures which are not yet depicted on any of these First Edition maps. In this way, unnecessary duplication can be avoided.

As the study area extends over a significant land portion, the discussion below will be done on a section by section basis.

7.2.1 Potential Heritage Sites depicted on Google Earth for the Section 1

The Google Earth imagery depicts two possible cemeteries, a livestock enclosure as well as three unidentified structures.

Table 9- List of features depicted on Google Earth for Section 1

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 77	Cemetery	S 28.086977 E 26.734331	A cemetery may be located here.
Feature 78	Structure	S 28.089015 E 26.734738	A livestock enclosure is located here. It is not clear whether this enclosure is an old stone-built one, or more recent.
Feature 79	Cemetery	S 28.097394 E 26.740139	A row of mounds is depicted here. It could possibly be a cemetery.
Feature 80	Structure	S 28.120667 E 26.719658	An unidentified structure is located here.
Feature 81	Structure	S 28.122340 E 26.723498	An unidentified structure is located here.
Feature 82	Structure	S 28.124384 E 26.727975	An unidentified structure is located here.

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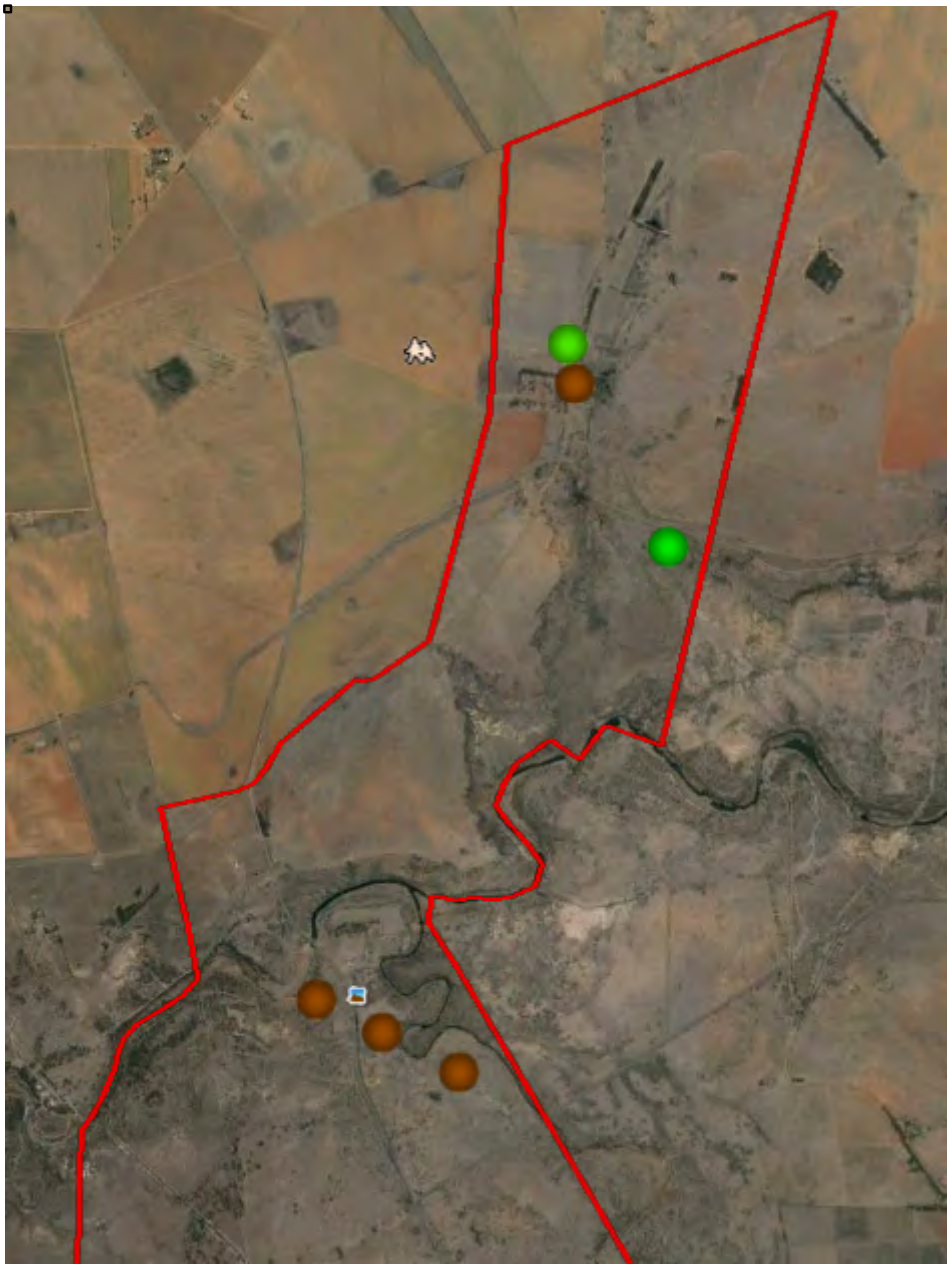

Figure 28 – Section 1 as depicted in the Google Earth. The structures are in brown and the cemeteries in green.

7.2.2 Potential Heritage Sites depicted on Google Earth for Section 2

The Google Earth imagery depicts five structures and one possible cemetery.

Table 10 - List of features depicted on Google Earth for Section 2

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 83	Structure	S 28.150607 E 26.741977	Two rectangular structures are located here.

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Feature 84	Structure	S 28.157665 E 26.729306	What appears to be a structure is located here. It is possible that this an agricultural structure from the recent past.
Feature 85	Structure	S 28.158586 E 26.725348	An oval structure is depicted here. It could possibly be a grave.
Feature 86	Structure	S 28.160643 E 26.722634	What appears to be a structure is located here.
Feature 87	Structure	S 28.181154 E 26.754124	An unidentified structure is located here.
Feature 88	Structure	S 28.184779 E 26.750970	A cluster of foundation structures is located here.

Figure 29 – Section 2 as depicted in the Google Earth. The structures are in brown and the cemeteries in green.

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7.2.3 Potential Heritage Sites depicted on Google Earth for Section 3

The Google Earth imagery depicts four rectangular structures on this Section 3.

Table 11- List of features depicted on Google Earth for Section 3

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 89	Structures	S 28.209299 E 26.721041	Foundation structures are located here.
Feature 90	Structures	S 28.232620 E 26.695971	Foundation structures are located here.
Feature 91	Structures	S 28.236241 E 26.677720	Foundation structures are located here.
Feature 92	Structures	S 28.246637 E 26.687248	Foundation structures are located here.

Figure 30 – Section 3 as depicted in the Google Earth. The structures are in brown and the cemeteries in green.

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7.2.4 Potential Heritage Sites depicted on Google Earth for Section 4

The Google Earth imagery depicts four rectangular structures on this Section 4.

Table 12- List of features depicted on Google Earth for Section 4

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 93	Structure	S 28.260805 E 26.704491	A rectangular structure is depicted here. It could possibly be a grave.
Feature 94	Structure	S 28.280068 E 26.672854	A rectangular structure is depicted here.
Feature 95	Structure	S 28.279873 E 26.671638	A rectangular structure is depicted here.
Feature 96	Structure	S 28.281023 E 26.671990	A rectangular structure is depicted here.

Figure 31 – Section 4 as depicted in the Google Earth. The structures are in brown and the cemeteries in green.

7.2.5 Potential Heritage Sites depicted on Google Earth for Section 5

The Google Earth imagery depicts four localities on this Section 5 where rectangular structures could be identified.

Table 13- List of features depicted on Google Earth for Section 5

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Feature 97	Structure	S 28.276750 E 26.756318	A rectangular structure is located here.

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Feature 98	Structure	S 28.278976 E 26.756636	A cluster of rectangular structures is located here.
Feature 99	Structure	S 28.284940 E 26.755168	A cluster of rectangular structures is located here.
Feature 100	Structure	S 28.268891 E 26.778598	A large rectangular structure associated with other smaller structures are located here.

Figure 32 – Section 5 as depicted in the Google Earth. The structures are in brown.

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7.3 Previous Archaeological and Heritage Research undertaken within the Study Area

7.3.1 Previous Archaeological and Heritage Contract Studies listed in SAHRIS

7.3.1.1 Previous Studies from within the Study Area

As far as could be established, the South African Heritage Resources Information System (SAHRIS) contains only two previous studies from within the present study area. These two reports are the Archaeological Scoping and Archaeological Impact Assessment for the same project.

- **Van der Walt, J. 2013. Archaeological Scoping Report for the Proposed Oryx Solar Energy Facility. Prepared for Savannah Environmental (Pty) Ltd**

- **Van der Walt, J. 2013. Archaeological Impact Assessment for the Proposed Oryx Solar Energy Facility. Prepared for Savannah Environmental (Pty) Ltd**

The area of study for both the archaeological scoping report and archaeological impact assessment was Portion 2 of the farm Kalkoenkrans 225. This farm portion is located on the north-eastern end of the present study area. As a result of the work, three heritage sites were identified, namely two brick structures and one cemetery. All three these sites are located within the present study area.

Table 14- List of heritage sites identified within the study area during previous archaeological and heritage studies.

FEATURE NUMBER	FEATURE TYPE	COORDINATES	COMMENTS
Site 1	Structure	S 28.182750 E 26.741889	Rectangular brick structure which is not older than 60 years.
Site 2	Structure	S 28.186472 E 26.740222	Rectangular brick structure which is not older than 60 years.
Site 3	Cemetery	S 28.185333 E 26.736861	A cemetery comprising more than 80 graves.

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7.4 Palaeontological Desktop Study

7.4.1 Introduction

PGS Heritage commissioned Dr. Gideon Groenewald to undertake a desktop survey, assessing the palaeontological sensitivity of the study area. In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature and previous palaeontological impact studies in the same region. The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged.

7.4.2 Geology of the Study Area

The study area is underlain by Permian aged sandstone and shale of the Adelaide Subgroup (Pa) of the Beaufort Group and Jurassic aged Dolerite of the Karoo Supergroup, Quaternary aged Aeolian sand of the Gordonia Formation (Qs) and Tertiary aged Alluvium (Figure 3.1).

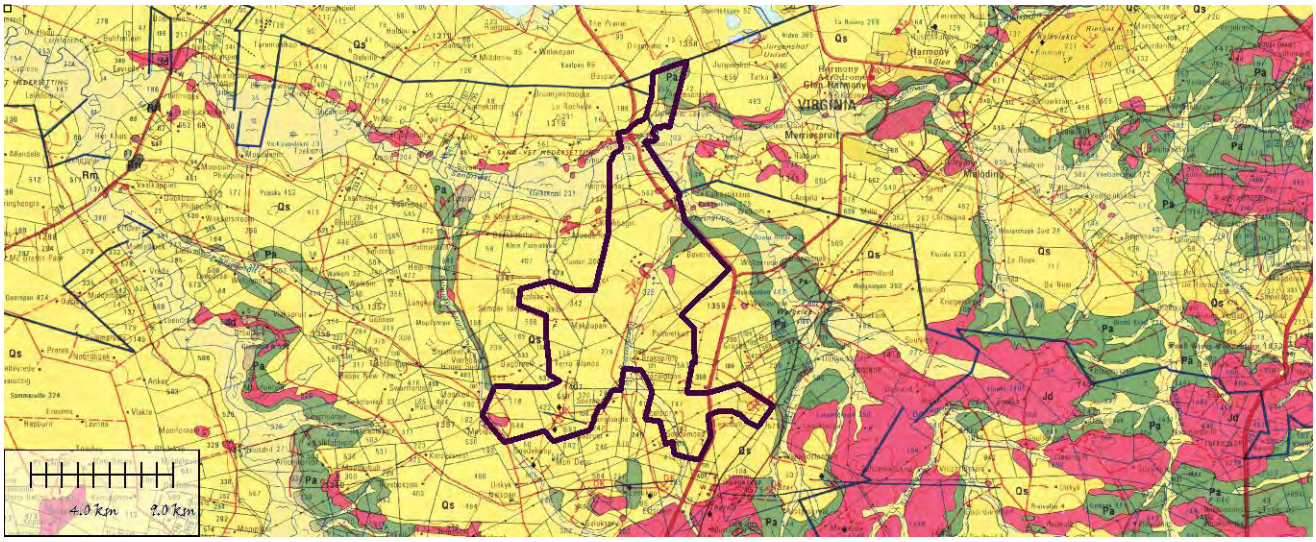

Figure 33 – Geology of the study area. The site is underlain by sediments of the Adelaide Subgroup (Pa), Dolerite (Jd), Windblown sand (Qs) and Alluvium.

7.4.2.1 Karoo Supergroup

Beaufort Group, Adelaide Subgroup (Pa)

The Adelaide Subgroup consists largely of coarse-grained sandstone and dark green to grey shale, with interbedded thin sandstone/mudstone units (Groenewald, 1996; Johnson et al, 2009).

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Dolerite (Jd)

Dolerite is a mafic intrusive igneous rock and occurs as dykes or sills in the study area. The Jurassic aged dolerite in the study area is associated with the "koppies" or high-lying areas in the region as well as with rocky outcrops along river courses.

7.4.2.2 Kalahari Group

Gordonia Formation (Qs)

The wind-blown sand in the study area can be ascribed to the newly named Gordonia Formation of the Kalahari Group and consists mainly of red coloured aeolian sand, alluvium, colluvium, spring tufa (calcareous) and sinter (siliceous), lake deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravel, windblown sand and calcrete layers (Johnson et al, 2009). The sand can vary from fairly thick (meter scale deposits) to very thin covering of Beaufort Group sedimentary rocks and dolerite.

7.4.2.3 Tertiary to Recent Alluvium

The study area is known for the presence of Tertiary aged sediments that represent fluvial deposits along the present river courses and these sediments are terrestrial sediments, including diatomite (diatom deposits), spring deposits, pedocretes, calcareous tufa and other clacrete deposits, peats, soils and gravel that are very important in terms of our understanding of the Early and Late Pliocene period in this region in Southern Africa (De Ruiter et al, 2010).

7.4.3 Palaeontology of the Study Area

7.4.3.1 Karoo Supergroup

Beaufort Group, Adelaide Subgroup (Pa)

The Beaufort Group is very well known as a treasure house of Palaeontological Heritage in Southern Africa (Smith, 1990; Rubidge (ed) 1995; Groenewald, 1996; Hancox et al, 1997; MacRae, 1999; McCarthy and Rubidge, 2005; Rubidge, 2005; Botha et al, 2006; Van der Walt *et al*, 2010; Smith *et al* 2012, Gastaldo *et al*, 2015). The Lower Beaufort Formation, known as the Adelaide Subgroup is still very under-studied in the Project Area although previous studies indicate it to be very productive in fossil assemblages not far (50km) towards the east at Winburg in South Africa where both the *Daptocephalus* and *Lystrosaurus* Assemblage Zones are very well represented by numerous fossil finds (Groenewald, 1996). Towards the far east and south new information (Van der Walt *et al*, 2010, Day *et al,* 2013;

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Viglietti *et al*, 2015, Rutherford *et al*, 2015, David Groenewald, Pers Comm, 2016) confirms very significant vertebrate and plant fossil remains. Plant fossils are mostly associated with *Glossopteris* Assemblages and are well-known from the Lower Beaufort Group (Groenewald, 1996, 2012, Bamford, 1999). Trace fossils, including very significant casts of vertebrate burrows have been described from the Adelaide Subgroup (Groenewald, 1996, Modesto et al, 2010; David Groenewald, Pers Comm. 2016).

Although large parts of the study area is covered in relatively thin (2m to 5m) layers of windblown sand of the so-called Gordonia Formation, small outcrops of Adelaide Subgroup sediments will be highly productive sites within these areas and must be inspected before development of infrastructure. The study area includes the notoriously difficult transition zone between the dominantly black marine shale deposits of the Ecca Group and the more arenaceous, fluvial deposits of the Beaufort Group and all information gathered during this project will make a significant contribution to our understanding of the contact between the Ecca and Beaufort Groups of the Karoo Supergroup.

"The richness of fossil tetrapods from the Beaufort Group of South Africa has enabled biostratigraphic subdivision of this Permo-Triassic succession, with global applicability. Despite being the thickest of the seven biozones recognised, attempts at further subdivision of the Middle Permian Tapinocephalus Assemblage Zone (Abrahamskraal Formation) have not been successful, largely because the exact stratigraphic ranges of fossil taxa are unknown. This gap in knowledge has limited stratigraphic correlation of the Abrahamskraal Formation and hindered understanding of Middle Permian Karoo basin development. Currently, the lowermost Beaufort Group is split between an eastern and a western stratigraphic scheme and, because of poor outcrop and the relative paucity of fossils in the east, stratigraphic correlation between the two areas has been uncertain. Recent fossil discoveries of the parareptile Eunotosaurus africanus in the Eastern Cape and Free State provinces have extended its known geographic range in the east. An additional specimen from the lower Middleton Formation in the Eastern Cape has, for the first time, enabled the biostratigraphic correlation of this unit with the Poortjie Member of the Teekloof Formation in the west. These finds confirm the diachroneity of the boundary between the marine Ecca Group and the terrestrial Beaufort Group." (Day *et al*, 2013).

The Adelaide Subgroup is relatively thin (100m) in the study area and fossil assemblages include but is not restricted to petrified wood, tetrapod faunas of the *Lystrosaurus* Assemblage Zone (dicynodonts, cynodonts, therocephalians, procolophonids, archosaurs etc.), including rich lacustrine biotas of amphibians, fish; trace fossils including vertebrate burrows, coprolites. The lower part of the Subgroup is known for examples of Diverse terrestrial and freshwater tetrapods of *Pristerognathus* to *Dicynodon* (now *Daptocephalus*) Assemblage Zones (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways), sparse to rich assemblages of vascular plants (Glossopteris Flora, including spectacular petrified logs) and insects. The sequence contains some of the richest Permo-Triassic tetrapod fauna from Pangaea/Gondwana, including trace fossils and casts of vertebrate burrows as well as plant fossils of the *Glossopteris* Assemblage (MacRae, 1999).

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Dolerite (Jd)

Due to the igneous nature of dolerite, no fossils will be found in the rock units.

7.4.3.2 Kalahari Group

Gordonia Formation (Qs)

The Gordonia Formation contains a very wide range of possible fossil remains, though these are often sparse, such as mammalian bones and teeth, tortoise remains, ostrich eggshells, non-marine mollusc shells, ostracods, diatoms and other microfossil groups, trace fossils (e.g. calcretised termitaria, rhizoliths, burrows, vertebrate tracks), freshwater stromatolites, plant material such as peats, foliage, wood, pollens and other micro-fossils (MacRae, 1999; Almond et al 2008, Groenewald et al, 2014).

7.4.3.3 Tertiary to Recent Alluvium

Bones and teeth of mammals (e.g. proboscideans, rhinos, bovids, horses, micromammals, early Homo (Florisbad Man (Homo heidelbergensis)); Cornelian and Florisian Mammal Age faunas), reptiles, fish, freshwater molluscs, petrified wood, trace fossils (e.g. termitaria), rhizoliths, diatom floras. Fauna is generally sparse but locally very rich. Scattered records with many areas being poorly studied (e.g. from ancient drainage systems). Key examples include sites at Cornelia, Uitzoek, Erfkroon, Florisbad, Vlakkraal and several sites where Orange River Gravels are preserved, including a site close to the study area known as the Virginia Railway Cutting site, now referred to as the Matjhabeng Site (De Ruiter *et al*, 2010).

Recent work revealed some significant finds of several taxa as is reported by De Ruiter and co-workers (2010) in a summary of their findings:

"*The early Pliocene is a relatively poorly understood period in southern Africa. Fossil deposits such as Langebaanweg (c. 5.0 Ma) and Makapansgat (c. 2.5 Ma) have each produced large and well-documented faunal assemblages, and it is clear that a significant turnover of fauna occurred between the early and late Pliocene respectively. However, the temporal separation between Langebaanweg and Makapansgat represents a significant gap in our knowledge of faunal composition and evolution in the Pliocene of southern Africa. In 2007 we began a programme of excavation at an early Pliocene locality referred to as Matjhabeng (formerly Virginia) in the Free State of South Africa. With an estimated age of 4.0–3.5 Ma, this site represents a temporal and geographic intermediate between the better known sites to the north and south. It also represents the only well-documented, river-deposited Pliocene locality in the central interior of southern Africa. After three years of excavation, we have recovered a diverse fauna that includes fish,*

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amphibians, reptiles, birds and mammals. Mammals range in size from rodents to mammoths, including an array of proboscideans, perissodactyls and artiodactyls, alongside rare carnivores. We report here on the macromammalian assemblage recovered to date. In total, we have recognized 29 taxa, including the oldest Ancylotherium and the oldest Megalotragus fossils in southern Africa. Some of the taxa from Matjhabeng are shared with Langebaanweg, and others with Makapansgat, confirming the intermediate status of this locality. Isotopic analysis reveals the earliest indication of extensive grasslands in South Africa, though these grasslands were part of an environmental mosaic that included significant woodland, and probable wetland, components. Keywords: Megalotragus, Mammuthus subplanifrons, faunal assemblage, isotopes, earliest grasslands.

Within the Free State, in fact within the central interior of southern Africa, the site of Matjhabeng affords the unique opportunity to examine the composition of an early Pliocene faunal assemblage recovered from a horizontally stratified, riverine deposit".

Table 1. List of taxa recovered during systematic excavations at Matjhabeng between 2007 and 2009.

Class	Order	Family	Tribe	Genus and species
Actinopterygii	Order indet.			
Amphibia	Anura	Family indet.		
Reptilia	Squamata	Agamidae		Gen. indet.
		Varanidae		*Varanus* sp.
		Gerrhosauridae		*Gerrhosaurus* sp.
		Elapidae		Gen. indet.
	Testudinata	Testudinidae		Gen. indet.
	Crocodylia	Crocodylidae		Gen. indet.
Aves	Podicipediformes	Podicipedidae		Gen. indet.
	Ciconiiformes	Threskiornithidae		Gen. indet.
Mammalia	Rodentia	Bathyergidae		cf. *Cryptomys*
		Muridae		Gen. indet.
		Gerbillinae		cf. *Tatera*
		Murinae		cf. *Aethomys*
				cf. *Euryotomys*
		Pedetidae		*Pedetes* sp.
	Insectivora	Soricidae		Gen. indet.
	Lagomorpha	Leporidae		Gen. indet.
	Proboscidea	Elephantidae		*Mammuthus subplanifrons*
	Carnivora	Hyaenidae		Gen. indet.
		Canidae		Gen. indet.
	Perissodactyla	Equidae		*Eurygnathohippus* sp.
		Chalicotheriidae		*Ancylotherium* sp.
	Artiodactyla	Giraffidae		*Sivatherium* sp.
		Hippopotamidae		*Hippopotamus* sp.
		Bovidae	Alcelaphini	*Megalotragus* sp.
				cf. *Damalacra* sp.
			Reduncini	Gen. indet.
			Antilopini	Gen. indet.
			Neotragini	Gen. indet.

Figure 34 – Table compied from De Ruiter et. al. (2010) with summary of Taxa recovered from Tertiary sediments at Matjhabeng.

7.4.4 Palaeontology of the Study Area

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged (Figure 5.1). The different sensitivity classes used are as follows:

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008, 2009) (Groenewald etal.,2014).	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended.
BLUE	Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in larger alluvium deposits. Collection of a representative sample of potential fossiliferous material is recommended.

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GREY	Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during implacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits.

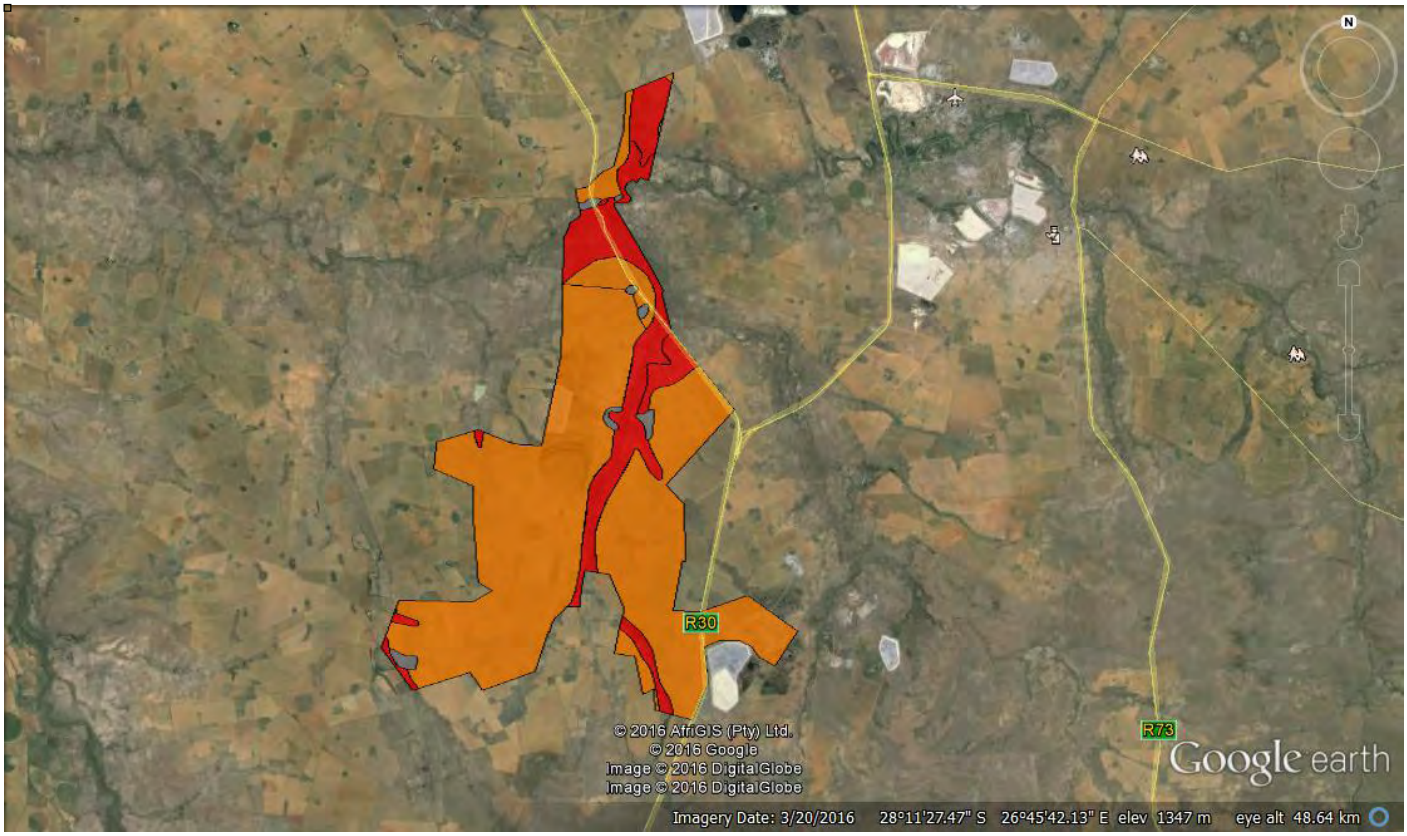

Figure 35 – Palaeo-sensitivity of the study area. Most of the study area is allocated a High Sensitivity with outcrops of Adelaide Supergroup sediments and Tertiary aged alluvium is allocated a Very High Sensitivity. Dolerite and dolerite scree is allocated a Very Low Sensitivity.

The Permian aged Adelaide Subgroup of the Beaufort Group, Karoo Supergroup underlies most of the study site and although large areas are covered in windblown sand of the Gordonia Formation, some areas are also underlain by Tertiary aged sediments that might contain similar fossils as those found at the Matjhabeng fossil site. Significant fossil bearing sediments underlies large sections of the study area and monitoring of the fossil heritage must be planned for these areas. Areas underlain by Adelaide Subgroup and those underlain by Tertiary aged sediments are Very Highly

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sensitive for Palaeontological Heritage and these areas must be monitored and subjected to Phase 1 PIA assessments before commencement of activities on site. Areas overlain by windblown sand are allocated a High Palaeontological sensitivity due to the fact that many fossil-rich sites are not mapped at the scale of the maps used and inspection of the proposed sites are necessary. Areas overlain by dolerite and dolerite scree, is allocated a Very Low Palaeontological sensitivity. Due to the igneous nature of dolerite, no fossils will be found.

7.4.5 Conclusions and Recommendations

The study area is mainly underlain by Permian aged rocks of the Adelaide Subgroup and Jurassic aged dolerite of the Karoo Supergroup as well as Quaternary aged Aeolian sand of the Gordonia Formation and Tertiary aged sediments associated with terrestrial deposits mainly referred to as the Matjhabeng type sediments close to Virginia in the Free State. The very high fossiliferous potential of the Adelaide Subgroup, Beaufort Group strata, warrants an allocation of a Very High palaeontological sensitivity to the areas underlain by the rocks of this Subgroup. A similarly Very High Palaeontological sensitivity is allocated to Tertiary aged sediments in this region. The Gordonia Formation is allocated a High Sensitivity and Dolerite areas are allocated Very Low Palaeontological sensitivity. If extensive excavation of topsoil and removal of more than 3m of soil cover is planned in this region, all the areas of activity will be allocated a Very High Palaeontological Sensitivity as these rocks can contain very significant remains of plants and animals that will contribute significantly to our understanding of the palaeo-environments in this part of the Karoo Basin.

The following recommendations are made:

- The EAP as well as the ECO for this project must be made aware of the fact that the Beaufort Group sediments contains very highly significant fossil remains, albeit mostly exposed during infrastructure development. Several types of fossils have been recorded from this Group in the Karoo Basin of South Africa, with special mention of the Adelaide Subgroup. Similar fossil richness is observed in Tertiary aged sediments at Matjhabeng.
- In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is envisaged (following the geotechnical investigation), or where fossils are recorded during the geotechnical investigations, a qualified palaeontologist must be appointed to assess and record fossils at specific footprints of infrastructure developments (Phase 1 PIA) before development as well as during excavations for the development.
- The Aeolian sand of the Gordonia Formation covers the rocks of the highly significant Adelaide Subgroup and all the areas underlain by this formation is allocated a High Palaeontological sensitivity and a qualified Palaeontologist must visit all the sites of outcrop before excavation and during the activities of the Project if excavation will be deeper than 1.5m.
- These recommendations must form part of the EMP of the project.

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8. FIELDWORK FINDINGS

This section deals with the findings of the site visit that was undertaken from Tuesday, 8 March 2016 to Friday, 11 March 2016. The heritage sites identified during the site visit represent the only heritage sites identified thus far which can be considered as confirmed. This said, the list of heritage resources provided here does not represent the full heritage inventory of the study area. This will only be achieved once detailed fieldwork in the form of walkthroughs of the any proposed development footprint areas are conducted.

The methodology utilised during the site visit was as follows:

- During the fieldwork, meetings were held with the individual landowners and/or their representatives. These meetings were aimed at obtaining any additional information on heritage sites which these individuals might have due to their often long-term presence on these properties. In some cases, only telephonic discussions took place with the landowners as they were not living on the property or were not on the farm at the time of our visits. The table below provides an indication of the meetings and telephone discussions held with the individual landowners and/or their representatives.

- The meetings with landowners and subsequent identification of known heritage resources, were augmented with general archaeological and heritage field survey work. Typical sites identified during this component of the fieldwork, include low visibility sites such as Stone Age lithic scatters and historic middens.

For the purposes of this report, thirty-six heritage sites have been confirmed in the field. They are depicted on the maps below, after which a description of each heritage site is provided. The individual heritage site descriptions include coordinates, the heritage significance of each site as well as photographs.

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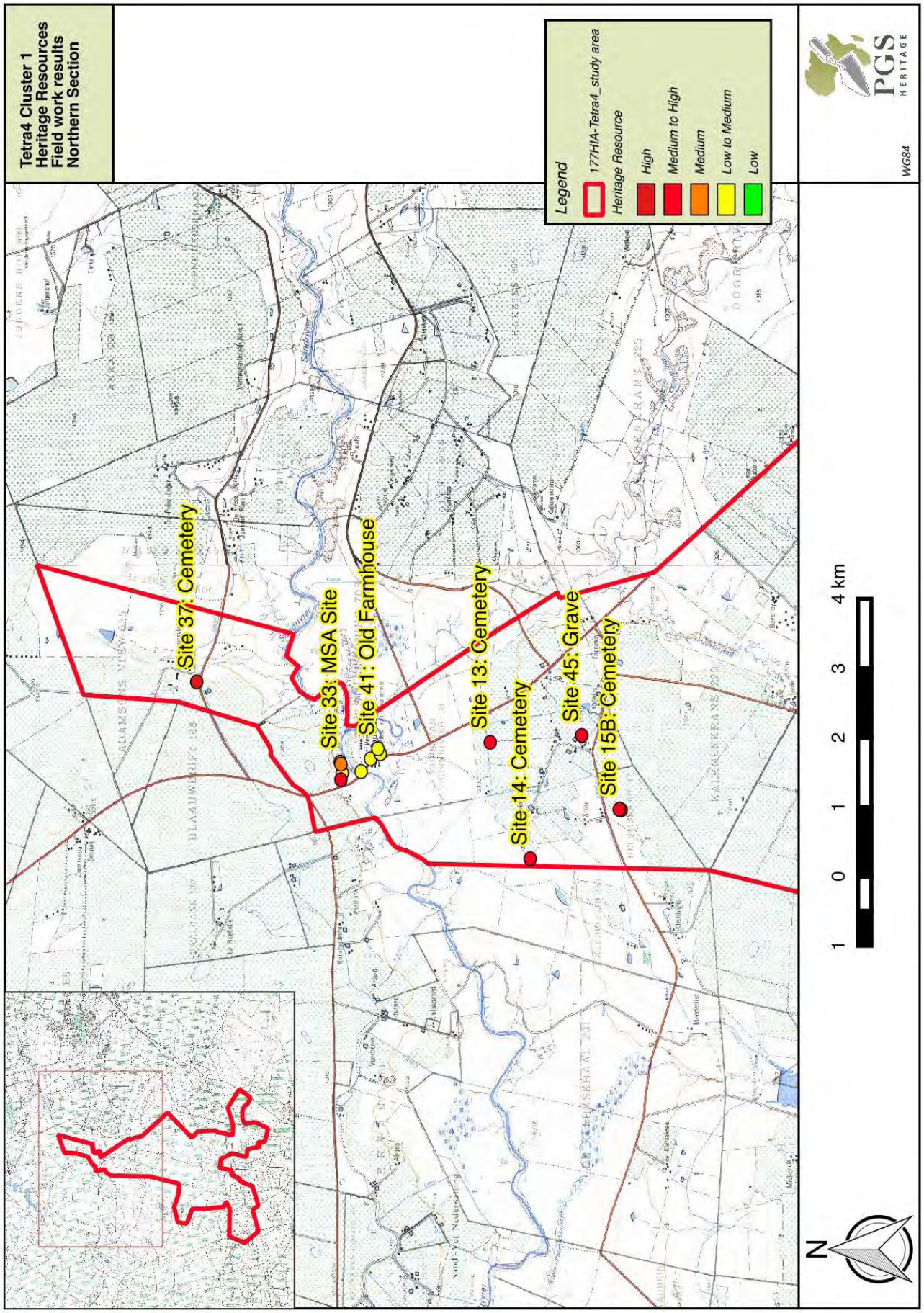

Figure 36 – Map depicting the distribution and significance of identified heritage sites within the northern end of the study area.

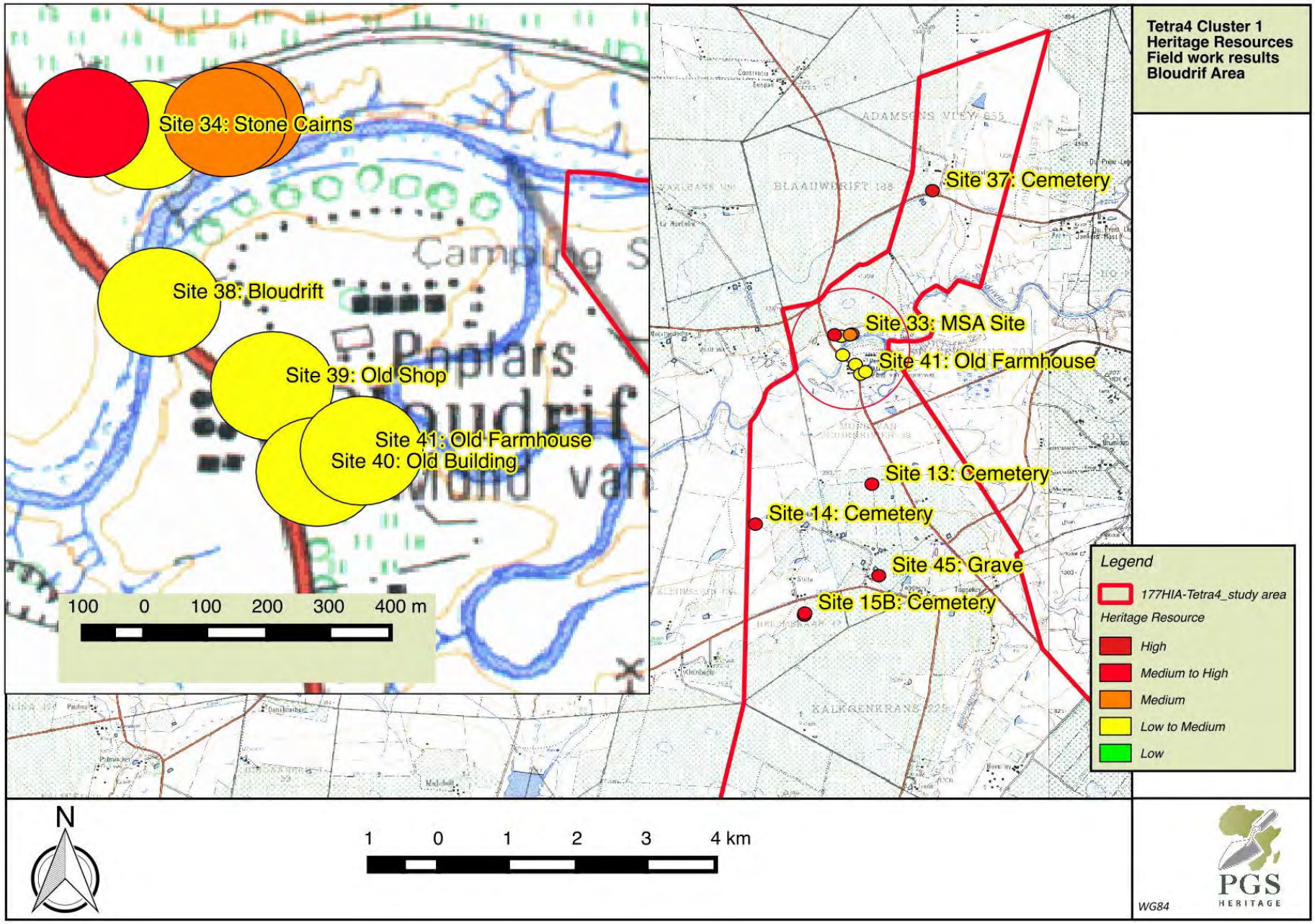

Figure 37 – More detailed view of a section of the northern end of the study area showing the identified heritage sites.

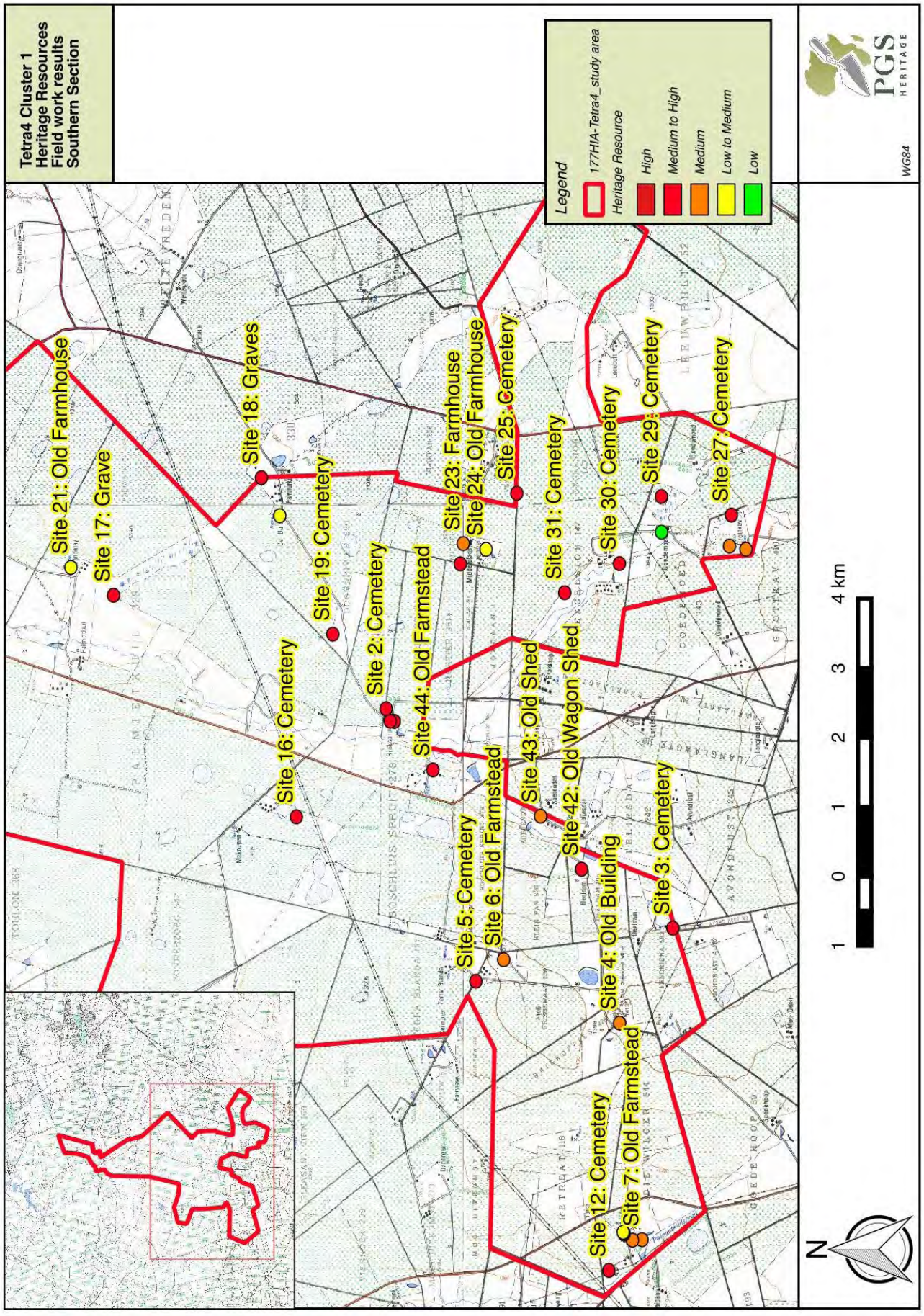

Figure 38 – Map depicting the distribution and significance of identified heritage sites within the southern end of the study area.

SITE	COORDS.	IDENTIFIED	DESCRIPTION
SITE 1A	S 28.24045 E 26.71786	Fieldwork	An old farmhouse with at least two identifiable construction phases; the core comprises a multi-roomed structure built with clay sundried bricks and mortar which is built in an English bond style. Largely enclosing the core is a kiln baked brick veranda on the northern and eastern sides as well as other additions. Associated structures include a water tank foundation, brick and cement reservoir and brick meat-processing room.
The farmhouse is older than 60 years, albeit in a poor state of preservation. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.			

SITE 1B	S 28.23986 E 26.71790	Fieldwork	An old wagon shed is located here. Its southern aspect is dressed sandstone and is joined to the stone built eastern façade with coining. The entire structure is 11 m x 20 m in extent and is divided via three internal walls of mud bricks and stone with room added to the northern side of the structure. All corners of the structure are joined with coined sandstone blocks.
The wagon shed is certainly older than 60 years and in all likelihood is older than 100 years as well. Considering its age, the structure is in a moderate state of preservation. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.			

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SITE 2	S 28.23925 E 26. 71972	Fieldwork	The Jordaan and Pienaar cemetery comprising at least four graves, three of which have headstones. While the area around the graves is reasonably well kept, the headstones and grave dressings are damaged. The position of this cemetery so close to the buildings and structures identified at Site 1, suggests that the two sites are associated with one anoter.

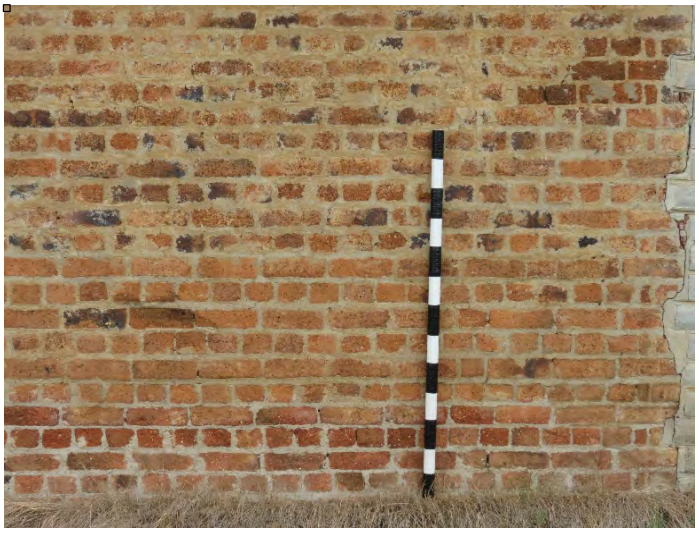
All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A

SITE 3	S 28.28139 E 26.74104	Fieldwork	A cemetery comprising 15 black graves of which three have cement headstones, one a welded steel railing enclosing the grave and 12 dressings of packed stone mounds. All the graves are aligned east-west.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 4	S 28.27356 E 26.67356	Fieldwork	A structure that has been repurposed as staff housing, appears to have been a shed or wagon shed. It has rollers for sliding doors still evident on the northern and southern façades, even though the openings have been bricked up to compensate for the new smaller doors. The brickwork visible on the walls of the structure was executed using the English bond method. The structure has a hipped roof and is 14m x 7m in extent. The structure would in all likelihood have been associated with the nearby Driekoppies Diamond Mine and its activities. The exact age of the building is not known, but it is certainly older than 60 years.

The structure is older than 60 years, and although it has been repurposed, many aspects of the original building are still evident. The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.



SITE 5	S 28.25244 E 26.67970	Fieldwork	A cemetery comprising 20 black graves including the deceased of the Pitso and Kututja families. Several of the graves have inscribed cement headstones or cement headstones with punctuated metal plaques as well as rectangular cement slabs. Others have no headstones but with well packed oval stone dressings. The cemetery is bisected by a fence. All the graves are aligned east-west.

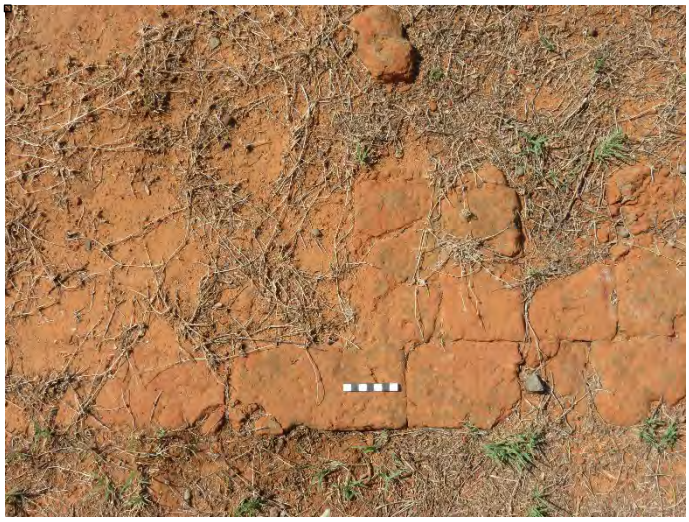
All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 6	S 28.25653 E 26.68287	Fieldwork	An old farmstead was identified here and comprises a dwelling, shed, cold room and pool. Although the dwelling is poorly preserved, its extent is 14 m x 16 m and has a stone foundation. The walls of the building were built using the English Bond method, and sun-baked bricks were used with mortar. A brick chimney was added later on the southern aspect. The shed comprises a rectangular brick structure which was built using the English Garden Wall Bond and the shed's extent is 16 m x 5 m. The cold room is 2 m x 2 m in extent with a shelf and volcanic rock as a cooling medium. A swimming pool is located to one side of the farmstead and is 8 m x 4 m in extent and 1 m deep. It has a baby pool on its southern end with steps on the northern end.

The buildings identified at the site are older than 60 years and some of them may be older than 100 years as well. Their state of preservation is poor. The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 7	S 28.27686 E 26.64173	Landowner	The site comprises two foundations and based on oral history one of these is the foundation of an original pioneer farmhouse. This foundation is 8 m x 8 m in extent with only small sections of the stone foundation and mud bricks still evident. The site is 50 m from the edge of a pan and a hand dug pit is located 30 m from the foundation structures on the edge of the pan.

The structures are older than 100 years but are in a very poor condition. These structures have some archaeological and historical significance though. The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.



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SITE 8	S 28.27546 E 26.64167	Landowner	The site comprises an old sheep shed and kraal. The shed has a stone foundation, its walls were built using the English Bond method and it has a hipped corrugated roof and a double corrugated hinged door. The kraal is extensive and has a large corrugated shaded area attached to the shed. The walling of the kraal is thicker at its base and tapers toward the rop. It is built of stone and mortar and is roughly 1.8 m (i.e. six feet) high.

The site is in a good condition and a good example of a sheep kraal and shed at least older than 60 years. The site is is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B

SITE 9	S 28.27422 E 26.64257	Landowner	The site comprises an old stone built shed, with a pitched corrugated iron roof.The shed has a stone foundation. A double hinged corrugated door is located on one end to allow storage of wagons or vehicals. A wooden louvre vent was originally installed above the double door for ventilation. Two old Caltex diesel tanks were found on a stand next to the shed. The shed is certainly older than 60 years, and may very well be older than 100 years as well.

The site is in a good condition and is certainly older than 60 years. This said, the building may in fact be older than 100 years as well. The site is is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B

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SITE 10	S 28.27419 E 26.64277	Landowner	The site comprises a rectangular stone reservoir, with an associated tank and is certainly older than 60 years. The thick reservoir walls are built of stone and mortar and is still being used today. The cement tank has a stone foundation.

The reservoir is in a good condition and still in use today. It is certainly older than 60 years, and may be older than 100 years as well. The site is is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 11	S 28.27409 E 26.64284	Landowner	The site comprises an old farmhouse which had been extensively modified over the years. Evidence of its original fabric remain, especially in the section now used as a garage, including wooden ceilings with beams as well as wooden framed sash windows. The building has a hipped corrugated roof. It seems likely that an old farmstead was located here comprising this dwelling, the dam (Site 10), shed (Site 9) and sheep shed and kraal (Site 8).

The core of the building is certainly older than 60 years and may be older than 100 years as well. However, it has been modified over the years and is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 12	S 28.27199 E 26.63723	Landowner	The site comprises a black cemetery of 24 graves. One grave has a formal engraved cement headstone and a brick lined dressing, another has a metal plaque headstone. Five of the graves are stone concentrations. Seventeen of the graves have upright stones as headstones and one has a stone outline and concrete headstone. The cemetery appears to have been the place of burial for farmworkers. The oldest marked grave was buried in 1963.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 13	S 28.13652 E 26.72375	Landowner	The site comprises a black cemetery of 26 graves, and includes the deceased of the Nhlapo and Nondela families. Six of the graves are stone concentrations, with unmarked upright stones on their western ends, two have cement brick linings, one has a clay baked lining with a cement headstone, one grave has a brick lining with a granite headstone and the remainder of the graves have small upright stones or concrete fragments. The graves are all buried in a single row along a farm boundary fence. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 14	S 28.14240 E 26.70665	Landowner	The site comprises a black cemetery of 40 graves. Four of the graves have metal plaques, with two containing the surname Mile. Another two graves have concrete linings and concrete headstones, with any information visible on the headstones. The remainder of the graves have concrete fragments and single upright stones, some with only a single upright stone at the foot of the grave. The site may have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 15A	S 28.15576 E 26.71384	Landowner	The site comprises approximately 30-40 black graves all aligned east-west. One of the graves is fenced off and another has a welded metal railing around it. Most of the graves have rectangular brick dressings and metal plaques. One of the graves is an oval stone packed grave with an old bicycle frame placed on top of the dressing. From information read on the inscribed headstones, it is evident that the graves from this cemetery include the deceased of the Ramalefane, Mutale and Makhoro families. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 15B	S 28.15547 E 26.71390	Fieldwork	The site comprises a modern black cemetery of 20 graves. Several of the graves have rectangular brick dressings and metal plaques, other comprise large sand mounds, with metal plaques and grave goods. From information read on the inscribed headstones, it is evident that the graves from this cemetery include the deceased of the Zwane, Mphuthi, Moleko and Ramalefane families. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 16	S 28.22607 E 26.70384	Fieldwork	The site comprises a black cemetery of 21 graves. One of the graves is granite lined and has a granite headstone, three are lined with concrete, one is lined with bricks and has an intricately engraved cement headstone, one has a small ornate cement headstone and the entire surface of the grave is lined with sunken flat stones. The remainder of the graves have upright unmarked stones with smaller foot pieces. All the graves are aligned east-west. From information found on the headstones, it is evident that the graves from this cemetery include the deceased of the Mxabaniso, Vanga, Delalazo and Botha families. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional and religious significance. The graves located here also have significant historical value. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 17	S 28.19919 E 26.73638	Landowner	The site comprises one visible black grave, with a metal marker, with no inscription. According to local tradition, a number of graves are buried at this location. While only one grave dressing could be observed, the position of the site on a farm boundary fence supports the oral history. The site may have been a small farmworker cemetery.

All graves have high levels of emotional and religious significance. The graves located here also have significant historical value. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 18	S 28.22093 E 26.75365	Landowner	The site comprises two black graves, one with a granite headstone and lined in granite with gravel dressing. The second grave is stone packed with a metal plaque. From the information found on the granite headstone, it is evident that the graves from this cemetery include the deceased of the Mokati family. This grave dates to 1978. The site may have been a small farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

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SITE 19	S 28.23142 E 26.73067	Landowner	The site comprises five graves, of which two are fenced soil heaps, with one upright stone. The other three graves are outside the fenced area, with soil heaps. Two of these latter graves have stones and one has a metal marker. No information could be obtained from the headstones or dressings. However, it seems likely that the site is a small farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 20	S 28.22363 E 26.74807	Fieldwork	The site comprises the original farm house of the farm, which has now been repurposed as a shed. The house is 13 m x12 m in extent. It has a hipped roof with metal tie rods on the eastern aspect. The original window sills have been bricked up and a double door added to the one facade. It is evident that the building is currently being used as a shed.

The farmhouse is older than 60 years but has been extensively modified over the years and is currently used as a shed. The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 21	S 28.19293 E 26.74047	Landowner	According to the landowner, Mr. Oosthuizen, this farmhouse was built in 1955. The house has since then been extensively modified by the three generations that have resided here. Mr. Oosthuizen kindly provided old photographs of the original house. A comparison between these historic photographs and the contemporary view of the dwelling today, cleary shows the significant modifications which have taken place here.

The farmhouse is older than 60 years, but has been extensivley modified. The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 22	S 28.25016 E 26.74100	Landowner	The site comprises a black cemetery of seven graves. Two of the graves have cement headstones, one has a stone concentration and four of the graves have upright stones. Only one of the cement headstones provided information of the deceased. From the information found on this headstone, it is evident that the graves from this cemetery include the deceased of the Khotso family. This grave dates to 1962. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 23	S 28.25059 E 26.74398	Fieldwork	The site comprises a farmhouse and small shed. The farmhouse is a yellow face brick building with a hipped roof construction. Accordin to the landowner, Mr. Du Plooy, the farmhouse was built in 1957. A small rectangular brick shed is located adjacent to the farm dwelling, and may be older than it. However, a date written in the concrete floor indicates that at least the floor of the building was cast on 29 April 1957. The core of the old shed has a hipped roof with an annex consisting of a curved corrugated roof.

Although the farmhouse may be just younger than 60 years, the adjacent shed appears to be older than the farmhouse. The site is of **Medium Significance**, which equals Generally Protected A (GP.B) / Grade 4B.

SITE 24	S 28.25394 E 26.74314	Landowner	The site comprises the foundation remains of the original Boshoff farmhouse, dating to the 1920/1930's. All that remains of the original farmhouse is a concrete and stone mixed foundation. No evidence for a midden could be found in association with this structure. According to Mr. Du Plooy, the graves of the Boshoff family graves were located in proximity to the site but had been moved to town by the family.

The foundation of the old farmstead is certainly older than 60 years, but its preservation is so poor that only a section of the foundation remains preserved. The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 25	S 28.25846 E 26.75136	Landowner	The site comprises a black cemetery of approximately 62 graves. Four of the graves have cement headstones and brick linings, four have metal headstones and two are stone concentrations with upright stones, two of the graves have concrete linings and headstones and one has a metal marker with 23 graves comprising soil heaps. The remainder have packed stone dressings. From information found on the headstones, it is evident that the graves from this cemetery include the deceased of the Marema and Masita families. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 26	S 28.28971 E 26.74361	Landowner	The site comprises the ruins of an old farmstead in amongst a forest of blue gum and pepper trees, which have completely overgrown the remains of the farmstead. The size of the trees, some of which are growing within the spot where the dwelling would have stood, underscores the length of time since this farmstead had been abandoned. It is clear that the site is older than 60 years and potentially older than 100 years as well. This means that if a midden is associated with the farmstead, it would be an archaeological site.

While only remnants of the farmstead remain, its age coupled with the possibility that an archaeological midden may be present here, suggest that the site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 27	S 28.29000 E 26.74817	Landowner	The site comprises a black cemetery containing 22 graves. Fourteen of these are stone concentrations and one has bricks for a dressing while seven have upright stones at the head and foot of the graves. Two of the graves have cement headstones on stone concentrations. From information found on the headstones, it is evident that the graves from this cemetery include the deceased of the Jafta family. The site appears to have been a farmworker cemetery.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 28	S 28.29213 E 26.74315	Fieldwork	A farmhouse with a hipped corrugated iron roof is located here. The original component of the dwelling sits on a stone foundation, and the walls of the original structure consist of thick plastered brick walls with grooves made in the plaster to give the walls a decorative appearance. The later additions were built on on a brick foundation and comprise yellow face brick walls. It is therefore clear that the building has been extended over the years. A brick cold room for meat processing as well as a tank is associated with the house.

The house is certainly older than 60 years, and potentially older than 100 years as well. Furthermore, the preservation of the dwelling is relatively good. The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 29	S 28.27971 E 26.75089	Landowner	The site comprises a black cemetery of 43 graves located within an agricultural field. Thirteen of the graves are stone packed while three graves have granite headstones. Of these three latter graves, one has a brick lining, another is stone packed and the third grave has an ornate metal railing. The graves appear to be buried in two rows. From information found on the headstones, it is evident that the graves from this cemetery include the deceased of the Ditalame and Manjo families. The site appears to have been a farmworker cemetery.
All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.			

SITE 30	S 28.27354 E 26.74104	Landowner	The site comprises a white cemetery, and contains two graves. One of the graves has a granite column headstone and granite lined dressing, with six columns on it and gravel dressing. The second grave is simply an upright stone on a stone base, with no visible inscription. The inscription on the granite grave dressing indicates that a member of the Kotze family lies buried here and that the person passed away in 1935.
All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.			

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SITE 31	S 28.26550 E 26.73676	Fieldwork	The site comprises a black cemetery of 108 graves. Four graves have granite headstones with granite-lined dressing whereas 17 graves have cement headstones, some with brick dressings and two with cement dressings. Five of the graves are soil heaps of which two are inside a metal fences. The remainder of the graves have stone packed dressings. The cemetery is located along a farm boundary fence. The inscription on the headstones from the cemetery's graves indicate that members of the Mosailane, Mboyane, Nomcayi, Thlapo, Katsamere, Seabelo and Tlhoholo families lie buried here. The site appears to have been a farmworker cemetery.

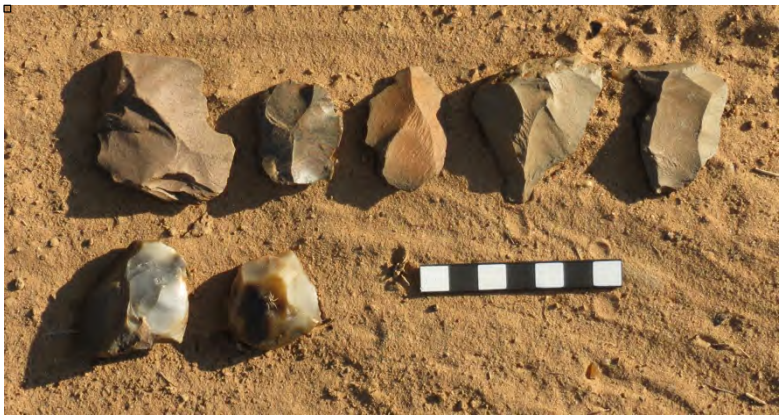
All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 32	S 28.27972 E 26.74566	Fieldwork	The site comprises a farmhouse with a thatched rondavel on one side and a face brick gable on the other. It is possible that the rondavel represents the first structure here, or that the original farmhouse (without the gable) and a separate rondavel represent the original structures. A separate metal roof cover has been erected over the entire house, with the thatch of the rondawel still intact. The site is associated with a cold room and water tank.

The farmhouse is older than 60 years, but has been extensively modified over the years. The structure is of **Low Significance**, which equals Generally Protected A (GP.C) / Grade 4C.

SITE 33	S 28.11447 E 26.72084	Fieldwork	A low density surface scatter of Middle Stone Age lithics were observed on the northern bank of the Sand River, roughly 100 m east of the bridge on the R30 between Welkom and Theunissen. The highest density of lithics observed at the site is two lithics per 1 m². The site extends over an area of roughly 25 m x 25m in size.

The site represents the only Stone Age site identified within the study area. It is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.



SITE 34	S 28.11478 E 26.71923	Fieldwork	The site comprises approximately 10 stone cairns built from stone and cement, and some of these cairns have metal pegs associated with them. The cairns are on average 0.6 m high and appears to have been painted white a very long time ago. While the exact function of these markers is not presently clear, it is possible that the original road passed through here and that these cairns were used as road markers to indicate the approaching drift. This possible interpretation is supported by the layout of the markers in that they were found in groups of two's spaced roughly 15 m apart with the section of land between each set of markers reasonably level, even though it is currently overgrown.

The structures are of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

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SITE 35	S 28.11457 E 26.72055	Fieldwork	The site comprises an old historic ash midden located on the northern bank of the Sand River. The exact historic association of the midden is not presently clear, however the artefacts observed here appear to be older than 100 years. The midden is approximately 15 m x15 m in extent and is eroding southwards towards the river. In the photograph below, a H&A Gilbey bottle, a porcelain ceramic sherd,glass stopper, a writing slate fragment, an aquamarine Lemos-type bottle fragment as well as medicine bottles including a De Witt bottle.

Due to the age of the midden, the site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 36	S 28.11458 E 26.71827	Landowner	The site comprises a black cemetery, with eight graves. One grave has a granite headstone with a granite-lined dressing, six of the graves have soil heaps with small upright stones at the head and foot whereas the remaining grave has a stone packed dressing. The inscription on the granite grave dressing indicates that a member of the Nohatsi family lies buried here and that the person passed away in 2005.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

SITE 37	S 28.09339 E 26.73264	Fieldwork	The site comprises a cemetery of 37 graves. One of the graves has a headstone which indicates that two people are buried there. This headstone indicates that members of the Adamson family lie buried here. Regarding the other graves, two have upright stones for headstones, one has vertically packed stones in a rectangle shape and the other 33 graves are stone packed, some with an upright stone at the head. The cemetery is located on the farm Adamson's Vley, and as a result it is evident that many of the graves from this cemetery are very old, and certainly older than 100 years.

All graves have high levels of emotional, religious and in some cases historical significance. Due to the age of the cemetery, and its historic nature, the site is deemed to be of **High Significance**, which equals Local Significance 3B / Grade LS 3B.

SITE 38	S 28.11755 E 26.71946	Fieldwork	The site comprises the concrete drift and adjacent bridge over the Sand River at Blaauwdrift. The drift predates the bridge and was embedded by two rocks. At least the drift is believed to be older than 60 years, although the possibility does exist for the bridge to be as old.

The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 39	S 28.11894 E 26.72133	Fieldwork	The site comprises the old shop at Moelbank. The building is not depicted on the First Edition of the 2826BA Topographical Sheet that was surveyed in 1945. However, it is depicted on the Second Edition of the same map sheet, which indicates the building is at least 62 years old. The building appears to have been modified over the years.

The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 40	S 28.12036 E 26.72208	Fieldwork	The site comprises a building that was recently converted to a shop known as “De Drift Trading Post” and which is currently used as a shed. The building appears to be older than 60 years.

The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

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SITE 41	S 28.12001 E 26.72281	Fieldwork	The site comprises an old farmhouse, built with yellow face brick and plaster. The building has a hipped corrugated iron roof. All the windows have steel window frames. The original front veranda of the building has been closed off. A brick cold room is associated with the building. The house is currently used as a pig sty.

The site is of **Low to Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.

SITE 42	S 28.26797 E 26.69615	Fieldwork	The site comprises two old wagon sheds located a short distance apart. The eastern shed is older and has a mud brick construction. It has a hipped roof and sits on a stone foundation. Although one of the walls of this structure is nearly falling over, the overall preservation of this old structure is relatively good. The western shed was built with orange face brick and has a hipped roof. This western shed appears to be older than 60 years whereas the eastern shed may be older than 100 years. It seems likely that these two structures formed part of a historic farmstead.

Due to the age of the site, coupled with the relatively good preservation of the oldest shed, the site is deemed to be of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

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SITE 43	S 28.26195 E 26.70394	Fieldwork	The site comprises what appears to be an old wagon shed. At least sections of the walls of the structure were built using mud bricks. The shed has a pitched corrugated iron roof. The building form part of a more modern farmstead including a dwelling and associated buildings.
The site is of **Medium Significance**, which equals Generally Protected B (GP.B) / Grade 4B.			

SITE 44	S 28.24613 E 26.71074	Fieldwork	An old farmstead was identified here and comprises a farm dwelling, shed as well as a number of outbuildings. The farmhouse is a plastered brick building with a hipped roof. The shed comprises a rectangular brick core (not unlike the shed identified at Site 9) with a pitched roof to which annexes were added. The shed sits on a stone foundation. Associated buildings include a small rectangular structure with a hipped roof. All these buildings formed part of a historic farmstead, and are certainly older than 60 years. Sections of the farmstead may in fact also be older than 100 years as well. The preservation of all the buildings at the site is relatively good, especially considering the age of some of these buildings.
The rarity of "Hartbeeshuisies affords this site **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.			

SITE 45	S 28.14996 E 26.67970	Landowner	The ashes of Mr. Lourens Lourens is buried in the garden of his son. The place is marked with a cross.

All graves have high levels of emotional, religious and in some cases historical significance. The site is of **Medium to High Significance**, which equals Generally Protected A (GP.A) / Grade 4A.

9. DESCRIPTION OF POTENTIAL IMPACTS

9.1 Potential Fatal Flaws

Fatal flaws would constitute environmental characteristics, which cannot or may not interact with the proposed development. From a heritage point of view, fatal flaws can be seen as a heritage resource/s present on the site that will halt the project and that cannot be mitigated due to site constraints such as limited space to implement buffer or no-go zones. In most case the implementation of buffer zones and extensive conservation management plans can change possible fatal flaws as noted in **Table 27**.

Table 15—Examples of heritage resources are provided below that could constitute a fatal flaw on a development site where buffer zones and exclusion zones are impossible to implement

Heritage Resource	Example
Rock Art	Rock art, in the form of paintings or engravings situated within a development area are seen as immovable resources and can only be moved under exceptional circumstances.
National or Provincial Heritage Sites	Site specific monuments like battles or major sites or structures with considerable significance.
Sacred Sites	Immovable sites associated with religion or cultural groupings, such as sacred pools, historic initiation school sites, etc.
Archaeological sites of National Significance	Sites such as Mapungubwe Hill or an archaeological landscape such as the Limpopo Valley or The Cradle of Humankind.
Cultural Landscapes of significance	Landscapes such as valleys and vistas held as being of national or international importance.

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9.2 Identified Non-Fatal Flaws

i. During the archival and historical desktop study undertaken for this project, it was revealed that an old diamond mine is located within the study area. Mining activities at the Driekoppies Diamond Mine located on the farm Welgegund (present day Driekoppies 422) goes back to at least the 1890s, and at the turn of the century the Driekopjes Diamond Mining Company which owned an interest in the farm, had as its founding director Sir Thomas Major Cullinan. However, at the time of the fieldwork, no evidence for such historic mining activities could be found and it would appear that more modern mining activities at the mine may have destroyed any historic tangible remains relating to the old mine. This said, one historic structure (older than 60 years) was identified in proximity to the mine (see Site 4).

ii. Similarly, during the archival and historical desktop study evidence was found that a component of the Battle of Zand River (7 – 10 May 1900) occurred within the study area. The Du Preez Leger Drift, located where the present road from Welkom to Theunissen crosses over the river, was used by British cavalry under command of the famous General John French to obtain a foothold on the northern bank of the river and outflank the main Boer force under General Louis Botha occupying the northern bank of the river. While the crossing of this drift was a significant component of the battle, the historic records of the battle indicate that no shots were ever fired here during the battle and that the drift was simply used by the cavalry to cross over the river. The concrete low water bridge which is certainly older than 60 year but post-dates the South African War, as well as the more modern road bridge, were recorded in the site database as Site 38.

iii. Within the study area, the largest majority of heritage sites identified at the desktop level comprise historic structures depicted as “huts” and “buildings”. However, the significance of these built structures can only be assessed at the ground verification stage. It is also important to note that the presence of historical structures is often associated with individual graves or cemeteries. The possible presence of graves can only be verified at the ground verification stage. Furthermore, and as indicated elsewhere, experience has shown that according to African tradition, graves of small children were traditionally buried in close proximity to the houses of their parents. This feature should be addressed as part of the project social consultation process.

iv. During the site visit a total of 45 sites were identified comprising 21 cemeteries, 22 historic structures and buildings, one Stone Age site, one historic midden of archaeological age and one site comprising historic road markers.

9.3 Identification of Areas for Further Specific Fieldwork

As noted previously, various structures and areas have been identified from historic map analysis. Further potential sites were also identified during the archival research undertaken for the study. Lastly, an examination of the Google Earth imagery has identified a number of areas with the potential for heritage sites. The structures and sites will be evaluated during the field verification stage and incorporated into the HIR. This said, it is also important to note that the entire study area as defined during the impact assessment phase will have to be covered by detailed fieldwork.

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9.4 Identification of Areas of Heritage Sensitivity

All the relevant sources of heritage information used in this study was summarised in a heritage sensitivity map. This map provides a zoned depiction of the study area wherein areas of varying heritage sensitivity are indicated. This map will be used in conjunction with the other sensitivity maps produced by the specialists to assess the feasibility of the proposed development and to allow the planning of the layout of the proposed development in such a way that the least possible impact is generated.

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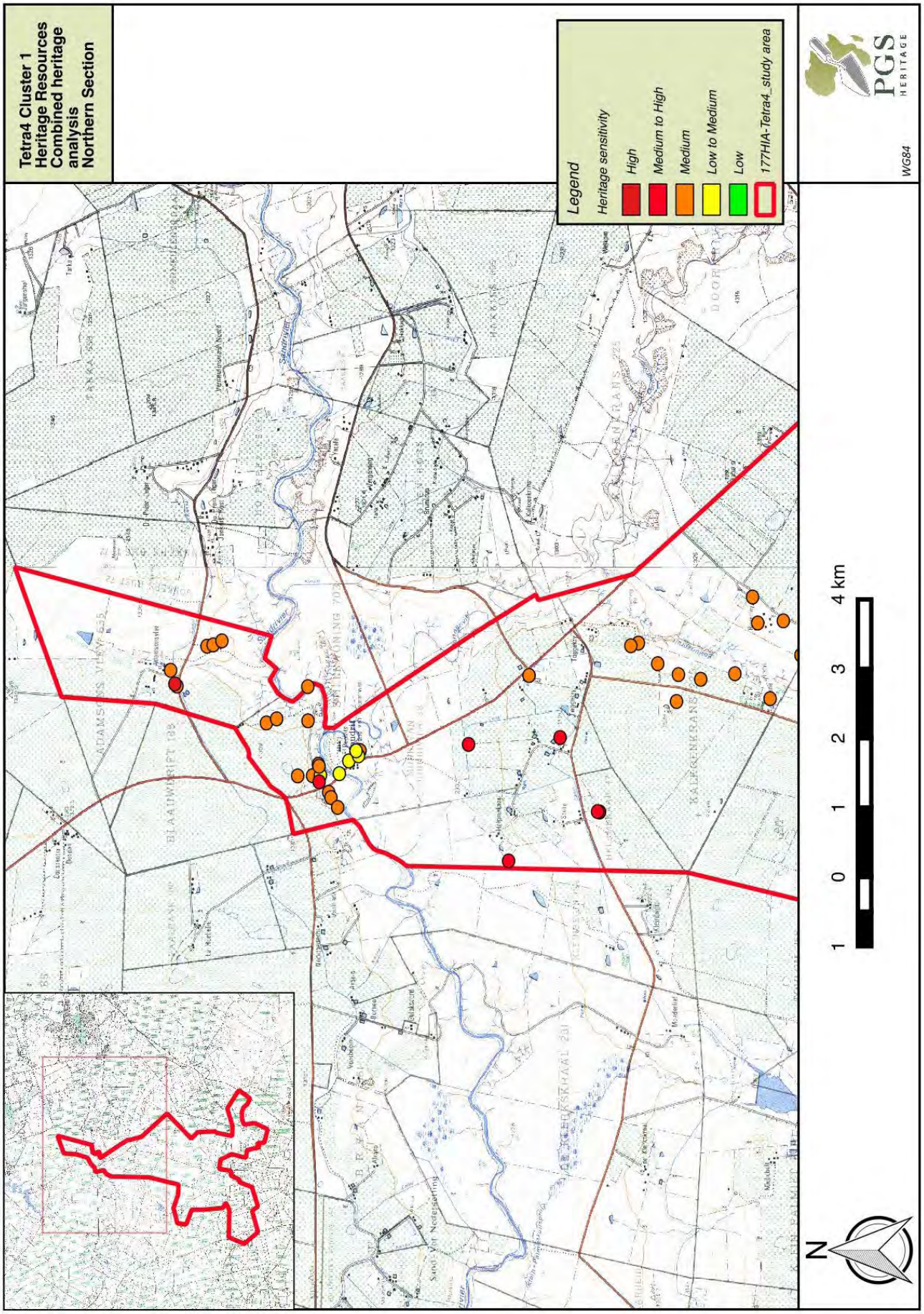

Figure 39 – Map depicting the combined heritage sensitive areas on the northern end of the study area. Please note that these depicted sensitivities exclude the palaeontological sensitivity.

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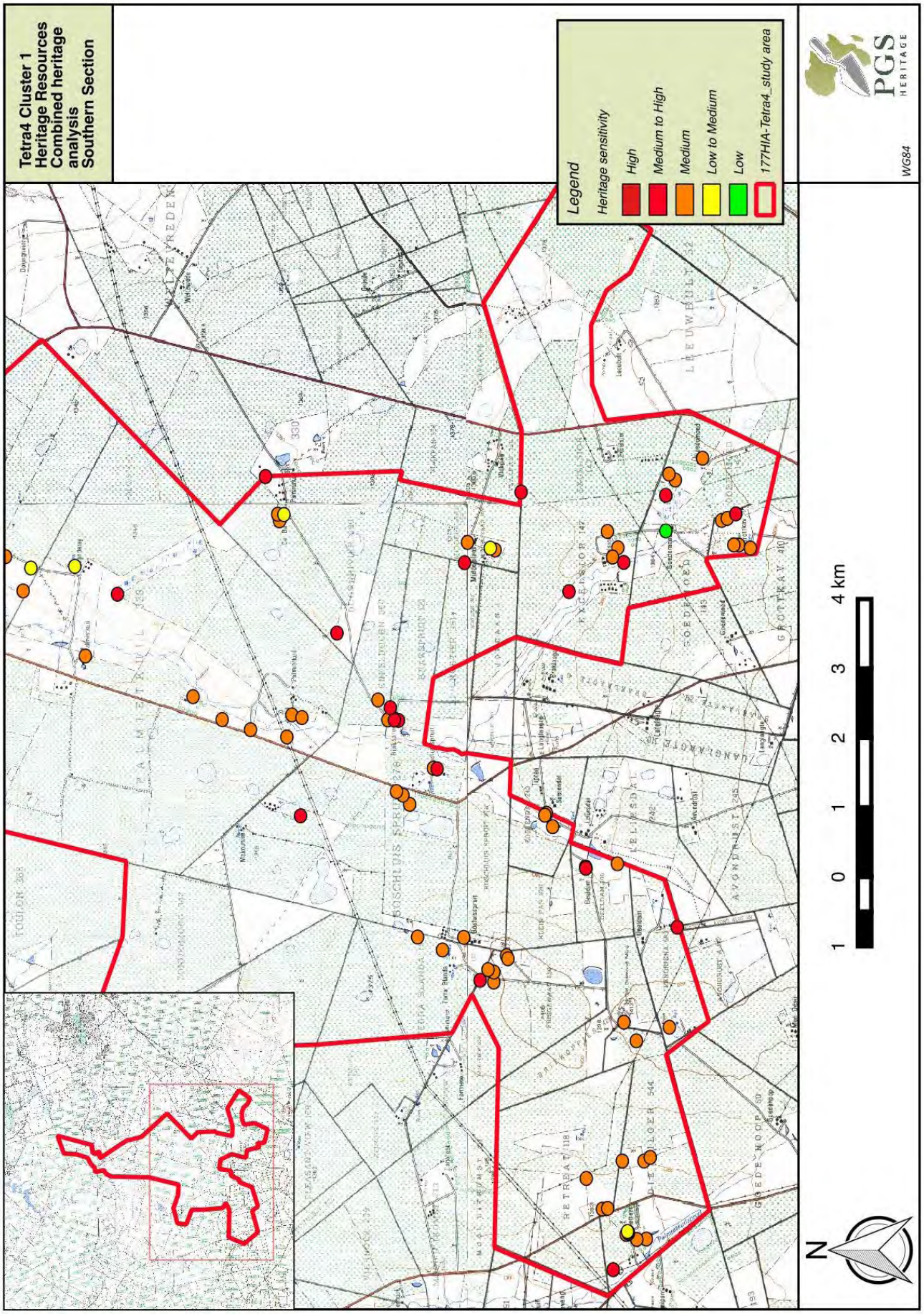

Figure 40 – Map depicting the combined heritage sensitive areas on the southern end of the study area. Please note that these depicted sensitivities exclude the palaeontological sensitivity.

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10. DETAILED PLAN OF STUDY FOR THE EIA AND EMP

The following will be required to develop a final HIA to manage the heritage resources within the proposed mining area.

10.1 Methodology

10.1.1 Physical Surveying

The fieldwork component will consist of a detailed walk through of the proposed footprint areas and is aimed at locating heritage resources falling within the proposed footprint areas. The locations of all heritage resources that are recorded during the survey will be documented using a hand-held GPS. Furthermore, the documentation will reflect a brief qualitative description and statement of significance for each site and include a photographic record of all the sites.

It is important to also note that informal social consultation (i.e. with local community members, residents and knowledgeable individuals) may be undertaken during the fieldwork component. The aim of social consultation is to identify any tangible and intangible resources (i.e. sacred places, myths and indigenous knowledge resources) that may exist.

10.1.2 *Deliverables*

A report will be written which would include the following components:

- The identification and mapping of all heritage resources in the affected area;
- An assessment of the significance of such resources in terms of the heritage assessment criteria;
- An assessment of the impact of the development of such heritage resources;
- If heritage resources will be adversely affected by the proposed development, consideration of the alternatives;
- Proposed mitigation of any adverse effects during and after the completion of the proposed development.

11. POTENTIAL IMPACTS AND FURTHER WORK FOR EIA PHASE

The desktop evaluation of the study area and surrounds has shown that the possibility exists of finding various heritage resources in the proposed study area, including historical structures, graves and cemeteries as well as rock art. A site visit was undertaken during which the findings of the desktop study was confirmed in that 36 sites were identified comprising 12 imizi (homesteads) (of which seven had cemeteries), six farm buildings (including an old farmhouse), five graves and cemeteries, two sites containing potsherds with the remaining 11 sites consisting of stone structures and enclosures. Once the final study area has been defined, this will have to be assessed by way of detailed walkthroughs during the HIA phase of the project. This will allow for an assessment of the actual impact of the proposed development on any heritage sites located there i.e. a footprint area specific heritage impact assessment.

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Table 16- Potential Impacts to Consider for Heritage Impact Assessment Phase

	IMPACT	STAGE OF PROJECT
ISSUE	**DISTURBANCE OR DESTRUCTION OF SECTIONS OF THE BATTLE OF ZAND RIVER**	**CONSTRUCTION**
DISCUSSION	The archival and historical desktop study has revealed that during the Battle of Zand River (7 May -10 May 1902) units of the British cavalry under command of General John French crossed over the Du Preez Leger Drift to outflank the Boer position on the northern bank of the river. This drift is located within the study area, where the bridge on the road between Welkom and Theunissen is located. This said, no shots were fired here as the drift was not held by the Boer forces.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Battlefields are protected by the NHRA, and under certain circumstances the core components of a particular battle site can be defined as a cultural landscape worth protecting. As no shots were fired at the drift or within the study area, the predicted impact will not be high enough to warrant a total exclusion of this area. Should any footprints be located within or near the drift, archaeological fieldwork and further archival and historical research should represent sufficient identification of any remaining tangible heritage aspects (i.e. camp sites used during the battle).	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. This should be augmented by further archival desktop study work on the battle. Should tangible or intangible sites or features be identified that will be impacted upon by the proposed development, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED		During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation and mitigation of identified tangible components of the battle must be planned and scheduled to fit within the timing of the project phases.

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	IMPACT	STAGE OF PROJECT
ISSUE	**DISTURBANCE OR DESTRUCTION OF TANGIBLE REMAINS OF THE OLD DIAMOND MINE AT WELGEGUND (PRESENT FARM DRIEKOPPIES)**	**CONSTRUCTION**
DISCUSSION	The archival and historical desktop study has revealed that diamond prospecting and mining activies were already undertaken by the 1890s on the farm Welgegund, located within the present study area. Historic mining activities continued intermittently until the 1930s, and based on information presently available, mining activities continued here after a hiatus of many decades. No mining activities currently takes place on site. Of heritage significance would be all tangible mining remains older than 100 years and buildings older than 60 years. In fact, one such a building was identified during the site visit in close proximity to the mine (see Site 4).	
EXISTING IMPACT	During the site visit, the mine site was also briefly visited and based on what was evident at the time, it would appear that tangible aspects relating to the historic diamond mining may have have been destroyed during later development and activities at the mine.	
PREDICTED IMPACT	Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction or damage of such sites requires a permit from the responsible heritage authority (NHRA, section 35). Fieldwork can provide valuable information on such sites in the study area and provide timeous management of such sites through various mitigation measures, including the realignment of the construction activities, if necessary.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. Should archaeological sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED		During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation of sites must be planned and

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		scheduled to fit within the timing of the project phases.
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF ARCHAEOLOGICAL SITES**	**CONSTRUCTION**
DISCUSSION	As seen from the archival work and discussion, the possibility of archaeological finds has been identified. During the fieldwork, two such archaeological sites were identified namely a Middle Stone Age surface scatter as well as a Historic Midden. The possibility certainly exists for more archaeological sites to be located within the study area, Once the development footprint areas have been confirmed, an archaeological foot survey must be undertaken of these footprint areas to identify any archaeological sites located there. This would assist in developing a comprehensive Heritage Management Plan for the construction activities.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction or damage of such sites requires a permit from the responsible heritage authority (NHRA, section 35). Fieldwork can provide valuable information on such sites in the study area and provide timeous management of such sites through various mitigation measures, including the realignment of the construction activities, if necessary.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Archaeological and heritage field survey of the footprint areas, once these have been established. Should archaeological sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED		During design and before construction no-go areas (if required) need to be demarcated. Alternatively, mitigation measures such as the archaeological excavation of sites must be planned and scheduled to fit within the timing of the project phases.

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	IMPACT	STAGE OF PROJECT
ISSUE	**DISTURBANCE OR DESTRUCTION OF HISTORIC BUILDINGS OR STRUCTURES**	**CONSTRUCTION, OPERATION**
DISCUSSION	The existence of historic buildings and structures within the study area has been confirmed during the site visit. During the fieldwork, a total of 22 sites comprising such buildings and structures were identified. The possible presence of even more historic structures was also revealed during the desktop study.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Damage/destruction of farm buildings and associated structures either directly (during construction of infrastructure or mining) or indirectly (i.e. blasting and vibration). Destruction or damage of such sites older than 60 years, would requiree a permit from the responsible heritage authority.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Avoidance of the identified farm buildings and associated structures in future proposed exploration footprints (where possible) and an archaeological field survey of any additional footprint areas not yet assessed. Should such sites be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED		During design and before construction, - Baseline assessment of structures - Permitting and controlled destruction of sites Operational - Evaluation of structures during mining against baseline data
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF GRAVES AND CEMETERIES**	**CONSTRUCTION**
DISCUSSION	The existence of graves and cemeteries has been confirmed during the site visit, with 21 cemeteries identified during the fieldwork, one cemetery known from a previous heritage assessment from within the study area and the likely presence of even more cemeteries revealed during the desktop study.	

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EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified graves and cemeteries and the discovery of such sites can seriously hamper construction and development timelines. Damage, destruction or removal of such sites requires a permit from various responsible authorities, including the Heritage Authority (NHRA, section 36), Provincial Health Department and the SA Police Service. Such a process can take up to 12 months to finalise. Fieldwork can provide valuable information on the presence of such sites in the study area and provide timeous management of such sites, which may include the realignment of the proposed development activities. In the event that identified graves and cemeteries cannot be avoided, a grave relocation process needs to be initiated, bearing in mind that such a process impacts on the spiritual and social fabric of the next of kin and associated communities.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	Avoidance of the identified cemeteries and graves in future proposed exploration footprints (where possible) and an archaeological field survey of any additional footprint areas not yet assessed. Should graves and cemeteries be identified, suitable mitigation measures will have to be outlined.	
WHEN IS MITIGATION REQUIRED		During design and before construction no-go areas need to be demarcated. Alternatively, mitigation measures such as the physical relocation of the graves in question (including aspects such as detailed social consultation) needs to be planned and scheduled to fit within the timing of the project phases. It must be understood that such a process may have an impact on the spiritual and social fabric of the next of kin and associated communities.
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE OR DESTRUCTION OF UNMARKED GRAVES**	**CONSTRUCTION**
DISCUSSION	From experience on similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the	

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	homesteads of black rural communities. These children were sometimes buried underneath the floors and walls of houses and huts and the burials were not marked, but were known to the immediate family.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified graves and the discovery of such sites can seriously hamper construction and development timelines. Damage, destruction or removal of such sites requires a permit from various responsible authorities, including the Heritage Authority (NHRA, section 36), Provincial Health Department and the SA Police Service. Such a process can take up to 12 months to finalise. Social consultation with present and former residents of the study area can provide valuable information on the presence of such sites in the study area and provide timeous management of such sites, which may include the realignment of the proposed development activities. Archaeological monitoring of the development footprint areas will identify any unmarked human skeletal remains. In the event that such graves cannot be avoided, a grave relocation process needs to be initiated, bearing in mind that such a process impacts on the spiritual and social fabric of the next of kin and associated communities.	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	A social consultation process with current and former residents of the study area can assess whether such sites are located within the study area. Archaeological monitoring during construction will also identify any human skeletal remains.	
WHEN IS MITIGATION REQUIRED		During design and before construction, social consultation needs to take place to assess whether such sites are located within the footprint areas. Archaeological monitoring during the construction phase will also identify any human remains.
	IMPACT	**STAGE OF PROJECT**
ISSUE	**DISTURBANCE, DAMAGE OR DESTRUCTION OF PALAEONTOLOGICAL RESOURCES**	**CONSTRUCTION, OPERATIONAL**
DISCUSSION	A palaeontological desktop study was done by Dr. Gideon Groenewald, which revealed that	

	most of the study area has a High Palaeontological Sensitivity whereas sections of the area have Very High Palaeontological Sensitivity with others allocated a Very Low Palaeontological Sensitivty.	
EXISTING IMPACT	None known.	
PREDICTED IMPACT	Unidentified palaeontological resources and the discovery of such resources can seriously hamper construction and development timelines. Damage, destruction or removal of such sites require a permit from the responsible heritage authority (NHRA, section 35).	Destruction or damage during the construction of the pipelines and other development components.
EIA INVESTIGATION REQUIRED	The mitigation measures recommended in the palaeontological desktop study must be undertaken.	
WHEN IS MITIGATION REQUIRED		During design and before construction, the mitigation measures outlined in the palaeontological desktop study will have to be undertaken. These are as follows: a) The EAP as well as the ECO for this project must be made aware of the fact that the Beaufort Group sediments contain very highly significant fossil remains, albeit mostly exposed during infrastructure development. Several types of fossils have been recorded from this Group in the Karoo Basin, with special mention of the Adelaide Subgroup. Similar fossil richness is observed in Tertiary aged sediments at Matjhabeng. b) In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is envisaged (following the geotechnical investigation), or where fossils are recorded during the geotechnical investigations, a qualified palaeontologist must be appointed to assess and record fossils at specific footprints of infrastructure developments (Phase 1 PIA) before development as well as during excavations for the development. C) The Aeolian sand of the Gordonia Formation covers the rocks of the highly significant Adelaide Subgroup and all the areas underlain by this formation is allocated a High Palaeontological sensitivity. A qualified palaeontologist

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	must visit all the sites of outcrop before excavation and during the activities of the Project if excavation will be deeper than 1.5m. d) These recommendations must form part of the EMP of the project.

12. CONCLUSIONS AND RECOMMENDATIONS

PGS Heritage was appointed by Environmental Impact Management Services (EIMS) to undertake a Heritage Scoping Report for the proposed Cluster 1 project by Tetra4 (Pty) Ltd. The study area is located between Welkom and Theunissen, Matjhabeng and Masilonjana Local Municipalities, Lejweleputswa District Municipality, Free State Province.

The purpose of the Heritage Scoping report is to identify at a desktop level what the probability is of heritage resources being identified in the study area. This is important because heritage resources are protected in terms of the National Heritage Resources Act, No 25 of 1999, (NHRA) from *inter alia*, destruction or damage, excavation or removal, or other disturbance, without a permit from the responsible heritage resources authority. The National Heritage Resources Act, No 25 of 1999, (NHRA) states that heritage resources are unique and non-renewable and, as such, any impact on such resources must be seen as significant (NHRA, section 5(1)(a)). The NHRA specifically protects certain categories of heritage resources, i.e.: structures, archaeological and paleontological (including meteorological) sites and material and graves and burial grounds (NHRA, sections 34, 35 and 36). Furthermore, Section 38 of the NHRA provides for and regulates the compilation of impact assessment reports of heritage resources that may be affected by construction or development activities.

The desktop research for the Heritage Scoping Report has revealed that the study area and surrounding landscape have a long and diverse historical and archaeological history and that significant potential exists for archaeological and historical sites and material to be located within the study area. The research has also identified specific possible heritage sensitive areas within the study area. A site visit was undertaken of the overall study area which identified a total of 45 heritage sites comprising 21 cemeteries, 22 historic structures and buildings, one Stone Age site, one historic midden of archaeological age and one site comprising historic road markers.

The Scoping Report will be followed by a a Heritage Impact Assessment (HIA), which would include the findings of this desktop study report and would provide recommendations for mitigation (destruction, recording and/or avoidance) of the confirmed heritage resources to be impacted upon by the proposed development. The period in-between the existing Heritage Scoping Report and the Final Heritage Impact Assessment Report will be used to finalise any footprints relating to the proposed exploration activities.

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The Heritage Scoping Report has highlighted a number of heritage aspects, some of which would require further assessment and mitigation in the subsequent Heritage Impact Assessment report. These aspects are palaeontology, historic buildings and structures, archaeological sites, cemeteries, the Battle of Zand River (7 – 10 May 1900), historic diamond mining activities on the farm Welgegund as well as unmarked graves from within the study area.

Battle of Zand River (7 – 10 May 1900)

The archival and historical desktop study has revealed that during the Battle of Zand River (7 May -10 May 1902), units of the British cavalry under command of General John French crossed over the Du Preez Leger Drift to outflank the Boer position on the northern bank of the river. This drift is located within the study area, where the bridge on the road between Welkom and Theunissen is located. This said, and based on available literature, no shots were fired here as the drift was not held by the Boer forces.

Archaeological field surveys of the proposed development footprint areas during the Heritage Impact Assessment should identify any tangible remains of these events. Additionally, should any development footprints be proposed within 600 m of the contemporary bridge where the R30 between Welkom and Theunissen crosses over the Sand River, further archival and historic research must be undertaken of the battle and any impacts that these development footprints may have on this component of the battlefield. If required, further mitigation measures will be outlined in the Heritage Impact Assessment.

Historic Diamond Mining Activities on the Farm Welgegund (Currently Driekoppies)

The archival and historical desktop study has revealed that historic diamond prospecting and mining activities occurred on the farm Welgegund. These activities were already in progress by the early 1890s, and appears to have continued almost unabated until the early 1930s. Mining activities appear to have continued more recently at Welgegund, but by the time of the site visit in 2016 these activities had evidently long been abandoned as well. One of the first companies involved here appears to have been the Van Rensburg Diamond Syndicate. The syndicate soild its interest in the farm to the Driekopjes Diamond Mining Company in 1892. Of interest is that the Driekopjes Company had Sir Thomas Major Cullinan as a founding director. Subsequent diamond mining companies involved at Welgegund include the New Driekopjes, Magnus, Triumph and Welgegund.

Archaeological field surveys of the proposed development footprint areas during the Heritage Impact Assessment should identify any tangible remains of these activities. Additionally, should any development footprints be proposed within 1 000 m of the centre of the mine pit on the farm Welgegund, further archival and historic research must be

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undertaken of the history and layout of the mine. If required, further mitigation measures will be outlined in the Heritage Impact Assessment.

Historic Buildings and Structures

Evaluation of archival and historic maps and satellite imagery, coupled with the fieldwork, have revaled that a number of historic buildings and structures are located within the study area. However, more sites may still be located within the overall study area. As a result, should any development footprints be defined, such footprint areas will have to be assessed in the field by way of archaeological field surveys to identify these features within the development footprint areas. Additionally, an assessment by an architectural historian of each historic building and structure located within or near such footprint areas will also have to be undertaken. These studies will be required to determine significance of each building or structure and will assess the possible development impacts on each of them during the Heritage Impact Assessment phase. At the same time appropriate mitigation measures will also be outlined.

Graves and Cemeteries

The site visit identified 21 cemeteries, with one additional cemetery not visited in the field confirmed by a previous heritage study. It is likely that even more cemeteries and grave sites are located within the study area. Any marked graves and cemeteries located within future development footprint areas will be identified during the archaeological walkthroughs of those footprint areas. Cemeteries and grave sites are protected by various legislations and the best option would be the in situ preservation of the sites. Should this not be possible, a standard grave relocation process (including a detailed social consultation process) must be undertaken.

Unmarked Graves in Homesteads

An evaluation of the available historic maps has revealed a significant number of historic homesteads of black African communities within the study area. The presence of these features raises another heritage concern, that of unmarked stillborb babies. In terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Cemeteries and grave sites are protected by various legislations and the best option would be social consultation with the former (or present) residents of this area to assess whether any such unmarked graves are located within the final study area for the HIA coupled by archaeological monitoring of the development activities.

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Archaeological Sites

Evaluation of archival and historic maps and satellite imagery, coupled with the fieldwork, have revaled that archaeological sites such as Middle Stone Age and Later Stone Age surface scatters, Historic Farmsteads and Historic Middens of Archaeological Age may very likely be located within the general study area. These sites are protected by the National Heritageb Resources Act. While some of these sites were identified during the site visit, others may still be located within the study area. As a result, should any further development footprints be defined, such additional footprint areas will have to be assessed in the field by way of archaeological field surveys to identify any such features which may be located there. These studies will be required to determine the significance of each site and to assess the possible development impacts on each of them during the Heritage Impact Assessment phase. At the same time appropriate mitigation measures will also be outlined.

Palaeontology

A palaeontological desktop study was undertaken by Dr. Gideon Groenewald, which revealed that the present study area is mainly underlain by by Permian aged rocks of the Adelaide Subgroup and Jurassic aged dolerite of the Karoo Supergroup as well as Quaternary aged Aeolian sand of the Gordonia Formation and Tertiary aged sediments associated with terrestrial deposits mainly referred to as the Matjhabeng type sediments close to Virginia in the Free State.

The very high fossiliferous potential of the Adelaide Subgroup, Beaufort Group strata, warrants an allocation of a Very High palaeontological sensitivity to the areas underlain by the rocks of this Subgroup. A similarly Very High Palaeontological sensitivity is allocated to Tertiary aged sediments in this region. The Gordonia Formation is allocated a High Sensitivity and Dolerite areas are allocated Very Low Palaeontological sensitivity. If extensive excavation of topsoil and removal of more than 3m of soil cover is planned in this region, all the areas of activity will be allocated a Very High Palaeontological Sensitivity as these rocks can contain very significant remains of plants and animals that will contribute significantly to our understanding of the palaeo-environments in this part of the Karoo Basin.

The following recommendations are made:

- The EAP as well as the ECO for this project must be made aware of the fact that the Beaufort Group sediments contains very highly significant fossil remains, albeit mostly exposed during infrastructure development. Several types of fossils have been recorded from this Group in the Karoo Basin of South Africa, with special mention of the Adelaide Subgroup. Similar fossil richness is observed in Tertiary aged sediments at Matjhabeng.

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- In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is envisaged (following the geotechnical investigation), or where fossils are recorded during the geotechnical investigations, a qualified palaeontologist must be appointed to assess and record fossils at specific footprints of infrastructure developments (Phase 1 PIA) before development as well as during excavations for the development.
- The Aeolian sand of the Gordonia Formation covers the rocks of the highly significant Adelaide Subgroup and all the areas underlain by this formation is allocated a High Palaeontological sensitivity and a qualified Palaeontologist must visit all the sites of outcrop before excavation and during the activities of the Project if excavation will be deeper than 1.5m.
- These recommendations must form part of the EMP of the project.

The data on the different types of heritage resources identified from the fieldwork will be compiled in a final HIA report. This report will utilise the Plan of Study for the EIA/HIA (***Section*** 8) as well as the significance rating (***ANNEXURES A and B***) to identify and rank the impacts on the heritage resources into the final detailed EIA investigation.

Potential impacts to be identified and evaluated during the EIA include:

- Disturbance / destruction of components of the battlefield on which the Battle of Zand River (7-10 May 1900) took place during the South African War - Physical survey of any proposed footprint areas by an experienced archaeologist, adherence to any required mitigation measures and the requirement for further archival and historical desktop study work on the battle should any component of the proposed development footprint be located within 600 m from the bridge on the road between Welkom and Theunissen.
- Disturbance / destruction of possible tangible remains which may be associated with the historic diamond activities on the farm Welgegund – Physical survey of any proposed footprint areas by an experienced archaeologist, adherence to any required mitigation measures and the requirement for further archival and historical desktop study work on the battle should any component of the proposed development footprint be located within 600 m from the bridge on the road between Welkom and Theunissen.
- Disturbance / destruction of palaeontological material – Recommendations from the palaeontological desktop study must be outlined in the EIA and EMP and must be undertaken as mitigation measures.
- Disturbance / destruction of historic buildings and structures – Avoidance of identified historic buildings and associated structures (where possible), physical survey of any proposed additional footprint areas, possible inclusion of architectural historian, adherence to any required mitigation measures.
- Disturbance / destruction of cemeteries and graves - Avoidance of identified graves and cemeteries (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures.

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- Disturbance / destruction of unmarked stillborn graves - Avoidance of identified historic black African homesteads (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures including social consultation and archaeological monitoring during construction phase.
- Destruction / damage of archaeological sites – Avoidance of identified sites (where possible), physical survey of any proposed additional footprint areas, adherence to any required mitigation measures

The desktop evaluation of the study area and surrounds has shown that the possibility exists of finding various heritage resources in the proposed study area, including historical structures as well as graves and cemeteries. A site visit was undertaken during which the findings of the desktop study was confirmed in that a total of 45 heritage sites comprising 21 cemeteries, 22 historic structures and buildings, one Stone Age site, one historic midden of archaeological age and one site comprising historic road markers.

It must be noted that the fieldwork for the present report was only a heritage scoping visit aimed at accessing as many properties as possible. No detailed walkthrough of any particular areas were undertaken. Once the development footprint areas are defined, these will have to be assessed by way of detailed walkthroughs during the HIA phase of the project. This will allow for an assessment of the impact of the proposed development on any heritage sites located there.

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13. REFERENCES

Published References

Bergh, J.S. 1999. *Geskiedenisatlas van Suid-Afrika: die Vier Noordelike Provinsies*. Van Schaik, Pretoria.

Changuion, L. *Silence of the Guns: The History of the Long Toms of the Anglo-Boer War*. Protea Book House, Pretoria.

De Bruin, J. C. 1960. *Hennenman ('n Gedenkboek*). Hennenman: Volkskool.

De Kock, M. G. W. 1985. *Gister is Verby! 1910-1985: Verhaal van die Ned. Geref. Gemeente Theunissen*. P.p 11 – 24.

De Ruiter, D.J., Churchill, S.E., Brophy, J.K. and Berger, L.R. 2011. *Regional Survey of Middle Stone Age Fossil Vertebrate Deposits in the Virginia-Theunissen area of the Free State, South Africa* in Navorsinge van die Nasionale Museum, vol. 27, part 1.

Duncan, P. 1915. *Report of the Select Committee on Rebellion* (SC1 '15) Cape Town, House of Assembly.

Deacon, H.J. & J. Deacon. 1999. *Human Beginnings in South Africa: Uncovering the Secrets of the Stone Age*. David Philip Publishers. Cape Town.

Erasmus, B.J. 2004. *On Route in South Africa*. Jonathan Ball Publishers, Johannesburg.

Felstar Publishers. 1968. *Welkom: Capital of the Orange Free State Goldfields*. Felstar Publishers (Pty) Ltd, Johannesburg.

Fourie, W. 2008b. *Archaeological Impact Assessments within South African Legislation* in South African Archaeological Bulletin, 63(187): 77 – 85.

Helme, N. 1974. *Thomas Major Cullinan: A Biography*. McGraw-Hill Book Company, Johannesburg.

Huffman, T.N. 2007. *Handbook to the Iron Age: The archaeology of Pre-Colonial Farming Societies in Southern Africa*. University of KwaZulu-Natal Press, Scottsville.

Johnson, J.P. 1910. *Geological and Archaeological Notes on Orangia*. Longmans, Green & Company, London.

Kuman K & R. J. Clarke. 1986. *Florisbad-New Investigations at a Middle Stone Age Hominid Site in South Africa*. Geoarchaeology: An International Journal, Vol. 1, No. 2, 103-125 (1986). John Wiley & Sons, Inc.

Langner, D. & A. Raath. 2014. *Die Afrikanerrebellie: 1914-1915*. Die Erwe van Ons Vaad're Nr. 6. Kraal Uitgewers, Pretoria.

Legassick, M. 2010. *The politics of a South African frontier: the Griqua, the Sotho-Tswana and the missionaries, 1780 – 1840*. Basler Afrika Bibliographien, Basel.

`

Lye, W.F. & C. Murray. 1980. *Transformations on the Highveld: The Tswana and Southern Sotho*. David Phillip, Cape Town.

Machens, E.W. 2009. *Platinum, Gold and Diamonds: The adventure of Hans Merensky's discoveries*. Protea Boekhuis, Pretoria.

Maggs, T.M. 1976. *Iron Age Communities of the Southern Highveld*. (Occasional Publication 2). Pietmaritzburg: Natal Museum.

Mason, R.J. 1969. *The Oppermansdrif Dam Archaeological Project: Vaal Basin* in The South African Archaeological Bulletin, Vol. 24, No. 95/96, pp. 182-192.

Maurice, J.F. & M.H. Grant. 1906. *History of the War in South Africa*. Hurst and Blackett, London.

Mayhew, V. 1982. Reader's Digest: Illustrated Guide to Southern Africa. *The Reader's Digest Association*.

Meintjies, J. 1973. *The Voortrekkers*. Cassell, London.

Nienaber, P. J. & Le Roux, C. J. P. 1982. *Vrystaat-Fokus*. Pretoria: Sigma Press (Pty) Ltd.

Oberholster, J.J. 1972. *The Historical Monuments of South Africa. The Rembrandt van Rijn Foundation for Culture*, Cape Town.

Pakenham, T. 1979. *The Boer War*. Bergvlei: Jonathan Ball Publishers.

Raath, A.W.G. 2007. *De La Rey: Die Stryd vir Vryheid*. Kraal Uitgewers, Pretoria.

Schoeman, K. *Bloemfontein: die ontstaan van 'n stad 1846 – 1946*. Human & Rousseau, Cape Town.

Shorten, J.R., 1970: *The Johannesburg Saga*. John R. Shorten (Pty) Ltd, Johannesburg.

The Mining Manual and Yearbook, 1914.

The Reader's Digest. 1994. *Illustrated History of South Africa: The Real Story*. The Reader's Digest Association Limited, Cape Town.

Van Schoor, M.C.E. 2007. *Christiaan Rudolph de Wet: Krygsman en Volksman*. Protea Boekhuis, Pretoria.

Union of South Africa, 1916. *Report of the Judicial Commission of Enquiry into the Causes of and Circumstances relating to the recent Rebellion in South Africa*, December 1916.

Visagie, J.C. 2011. *Voortrekkerstamouers: 1835 – 1845*. Protea Boekhuis, Pretoria.

Wadley, L. 2013. *Recognizing complex cognition through innovative technology in Stone Age and Palaeolithic sites* in Cambridge Archaeological Journal, 23: 163-183.

Warwick, P. 1983. *Black People and the South African War: 1899 – 1902*. Ravan, Johannesburg.

`

Unpublished References

Dreyer, J.J.B. 1990. *The Iron Age Prehistory of the Winburg Area, Orange Free State*. Unpublished MA Dissertation, University of the Witwatersrand.

Rossouw, L. n.d. *Phase 1 Heritage Impact Assessment of a proposed new rehabilitation facility at Odendaalsrust, Free State Province.* Prepared for EKO Environmental Consultants.

Van der Walt, J. 2013. *Archaeological Scoping Report for the proposed Grootkop Solar Energy facility*. Prepared for Savannah Environment (Pty) Ltd.

Van der Walt, J. 2013. *Archaeological Scoping Report for the Proposed Oryx Solar Energy Facility*. Prepared for Savannah Environmental (Pty) Ltd.

Historic Topographic Maps

All the historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development and Land Reform in Cape Town.

Google Earth

All the aerial depictions used in this report are from Google Earth.

Internet References

www.angloboerwar.com
www.nzetc.victoria.ac.nz
www.sahistory.org.za
www.sahra.org.za
www.sibanyegold.co.za
www.wikipedia.org

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ANNEXURE A

HERITAGE ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies to be utilised in the HIA.

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage and Grave Relocation Consultants (PGS) for the proposed project will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the National Heritage Resources Act (NHRA) (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consisted of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

- Step II – Physical Survey: A physical survey will be conducted on foot through the proposed project area by qualified archaeologists', aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

- Step III – The final step involves the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites is based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

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Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, will be used for the purpose of this report.

Table 17: Site significance classification standards as prescribed by SAHRA

FIELD RATING	**GRADE**	**SIGNIFICANCE**	**RECOMMENDED MITIGATION**
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.C)	-	Low Significance	Destruction

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ANNEXURE B

THE SIGNIFICANCE RATING SCALES FOR THE EIA

Method of Assessing Impacts

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 18:

Table 18: Criteria for determination of impact consequence.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.

	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 19.

Table 19: Probability scoring.

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

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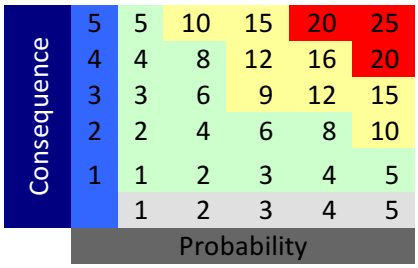

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 20.

Table 20: Significance classes.

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

Impact Prioritisation

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in Section 0 it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented.

Table 21: Criteria for the determination of prioritisation.

Public response (PR)	Low (1)	Not raised as a concern by the I&AP's
	Medium (2)	Issue/ impact raised by the I&AP's
	High (3)	Significant and meaningful response from the I&AP's
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.

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	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 21. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (refer to Table 22).

Table 22: Determination of prioritisation factor.

Priority	Ranking	Prioritisation Factor
= 3	Low	1
3 > 9	Medium	1.5
= 9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Environmental Significance Rating	
Value	**Description**
< 9	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥9; <17	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 17	High (i.e. where the impact must have an influence on the decision process to develop in the area).

For ease of use a template impact assessment form has been drafted which will need to be completed by each specialist for each relevant impact, and where necessary for each alternative. The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

ANNEXURE C

IMPACT ASSESSMENT SHEETS

While five project phases exist (Planning, Construction, Operation, Decommissioning and Rehab and Closure), only impact sheets for the Construction Phase are included here. The reason for this is that only limited to no impacts are expected on the identified heritage issues during the other phases of the project.

Impact Name	Disturbance/ Destruction of Sections of the Battle of Zand River				
Alternative	Not Applicable				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	3
Extent	5	5	Reversibility	5	5
Duration	5	5	Probability	3	2
Environmental Risk (Pre-mitigation)					-14.25
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-8.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-9.92

Impact Name	Disturbance/Destruction of Old Diamond Mine at Welgegund				
Alternative	Not Applicable				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	3
Extent	4	3	Reversibility	5	5
Duration	5	5	Probability	3	2
Environmental Risk (Pre-mitigation)					-13.50
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-8.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-9.33

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Impact Name	Disturbance/Destruction of Archaeological Sites				
Alternative	**Not Applicable**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	3
Extent	4	3	Reversibility	5	4
Duration	5	5	Probability	4	3
Environmental Risk (Pre-mitigation)					-18.00
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-11.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-13.13

Impact Name	Disturbance/Destruction of Historic Buildings or Structures				
Alternative	**Not Applicable**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	3
Extent	4	3	Reversibility	5	4
Duration	5	5	Probability	4	1
Environmental Risk (Pre-mitigation)					-18.00
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-11.25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-13.13

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Impact Name	Disturbance/ Destruction of Graves and Cemeteries				
Alternative	**Not Applicable**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	5	4
Extent	5	4	Reversibility	5	5
Duration	5	5	Probability	4	3
Environmental Risk (Pre-mitigation)					-20.00
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-13.50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-15.75

Impact Name	Disturbance/ Destruction of Unmarked Graves				
Alternative	**Not Applicable**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	5	4
Extent	5	4	Reversibility	5	5
Duration	5	5	Probability	4	3
Environmental Risk (Pre-mitigation)					-15.00
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					-9.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					-10.50

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Impact Name	Disturbance/Destruction of Palaeontological Resources				
Alternative	**Not Applicable**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	1	Magnitude	3	3
Extent	5	4	Reversibility	5	5
Duration	5	5	Probability	5	4
Environmental Risk (Pre-mitigation)					-22.50
Mitigation Measures					
See above.					
Environmental Risk (Post-mitigation)					17.00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or subsitituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1.17
Final Significance					19.83

ANNEXURE D

PALAEONTOLOGICAL DESKTOP STUDY

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