



**PHASE 1 HIA REPORT AGRICULTURAL AND IRRIGATION
DAM DEVELOPMENT, OLYVENHOUTS DRIFT
SETTLEMENT, NORTHERN CAPE**

**PROPOSED DEVELOPMENT OF AN IRRIGATION DAM AND
AGRICULTURAL EXPANSION ON ERVEN 1074 AND 754,
OLYVENHOUTS DRIFT SETTLEMENT, UPINGTON,
DAWID KRUIPER MUNICIPALITY, Z.F. MGCAWU DISTRICT
MUNICIPALITY, NORTHERN CAPE.**

PREPARED FOR:
ENVIROAFRICA

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For this project, Mr Engelbrecht was responsible for the field survey of the development footprint, identification of heritage resources, and recommendations. Ms Fivaz was responsible for research and report compilation.

Declaration of independence:

We, Jan Engelbrecht and Heidi Fivaz, partners of UBIQUE Heritage Consultants, hereby confirm our independence as heritage specialists and declare that:

- we are suitably qualified and accredited to act as independent specialists in this application;
- we do not have any vested interests (either business, financial, personal or other) in the proposed development project other than remuneration for the heritage assessment and heritage management services performed;
- the work was conducted in an objective and ethical manner, in accordance with a professional code of conduct and within the framework of South African heritage legislation.



Signed:

J.A.C. Engelbrecht & H. Fivaz
UBIQUE Heritage Consultants

Date: 2020-11-03

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CRM ARCHAEOLOGIST

Jan Engelbrecht is accredited by the Cultural Resources Management section of the Association of Southern African Professional Archaeologists (ASAPA) to undertake Phase1 AIAs and HIAs in South Africa. He is also a member of the Association for Professional Archaeologists (ASAPA). Mr Engelbrecht holds an honours degree in archaeology (specialising in the history of early farmers in southern Africa (Iron Age) and Colonial period) from the University of South Africa. He has 12 years' experience in heritage management. He has worked on projects as diverse as the Zulti South HIA project of Richards Bay Minerals, research on the David Bruce heritage site at Ubombo in Kwa-Zulu Natal, and various archaeological excavations and historical projects. He has worked with many rural communities to establish integrated heritage and land use plans and speaks Zulu fluently. Mr Engelbrecht established Ubique Heritage Consultants during 2012. The company moved from KZN to the Northern Cape and is currently based at Askham in the Northern Cape within the Dawid Kruiper Local Municipality in the Kgalagadi region. He had a significant military career as an officer, whereafter he qualified as an Animal Health Technician at Technikon RSA and UNISA. He is currently studying for his MA Degree in Archaeology.

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EXECUTIVE SUMMARY

Project description

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA), to conduct a cultural heritage assessment to determine the impact of the proposed agricultural and irrigation development on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape, on any sites, features, or objects of cultural heritage significance.

The project involves the development of an irrigation dam (reservoir) and the establishment of vineyards on three different plots. The proposed development sizes are as follow:

Erf 1074	- Dam development	1.2 ha
	- Development 1	10.6 ha
	- Development 2	8.0 ha
Erf 754	- Development 3	13.4 ha

No roads will be constructed as existing access roads will be used to gain access to the site. The site coordinates are 28°27'45.02"S, 21°17'2.87"E.

This report is an amendment to our report submitted to SAHRIS CaseID: 14834,

Fivaz, H., & Engelbrecht, J. 2020 (February). PHASE 1 HIA REPORT AGRICULTURAL IRRIGATION DEVELOPMENT, OLYVENHOUTS DRIFT SETTLEMENT, NORTHERN CAPE: Proposed Development of a Pipeline, Irrigation Dam and Agricultural Expansion on Erven 453, 281, 1074 and 754, Olyvenhouts Drift Settlement, Upington, Dawid Kruiper Municipality, Z.F. Mgcawu District Municipality, Northern Cape. Unpublished report. UBIQUE Heritage Consultants: Roodepoort.

Since the initial report, the scope of the project has been adjusted to accommodate more vineyards and avoid the graveyard that might have been impacted by the original proposed location of the irrigation dam. No additional fieldwork was conducted for this report, as the original survey covered the development footprints as set out in this report.

Findings and Impact on Heritage Resources

Seventeen occurrences of lithic material were recorded across the surveyed area on or in close vicinity to the development footprints on Olyvenhouts Drift Erf 1074. The recorded lithic material consists of low- to medium-density background MSA scatters with cores, scrapers, a bladelet, untrimmed flakes, chips and knapping debris, made predominantly from BIF (Banded Ironstone Formation), with a few isolated pieces produced from CCS (Crypto-Crystalline Silicates) and dolomite pieces. The found lithic material shows various degrees of weathering and are without

substantial archaeological context or matrix, and are therefore deemed of minor scientific importance, and not conservation worthy (NCW).

Four occurrences of colonial period material were recorded on Olyvenhouts Drift Erf 1074. Fragments of hole-in-cap tins, square key-wind tins, and hand- and machine-soldered tins dating between the late-19th and early-20th century, as well as a Gargoyle MobilOil, can top dating between 1920-1940, were recorded. The material sample is small and without substantial archaeological context. The development impact on these resources is, therefore, inconsequential and these artefacts are deemed as not conservation worthy (NCW).

There are 27 visible graves of various sizes situated in the middle of Development 1 and 2. The graves are demarcated with quartz and quartzite stones, and many of the graves have local fieldstone headstones.

The impact of the development of the proposed vineyards on Development footprint 1 and 2 will have a negative impact on the identified heritage resources recorded on Olyvenhouts Drift Erf 1074. However, the cultural material is without any substantial archaeological context and deemed not conservation worthy. The negative impact is, therefore, negligible. The graves are of high significance, but the probability of impact on the graves are low, with the new proposed location of the irrigation dam. The probability of the development impacting on palaeontological heritage during the construction phase is regarded as minimal, and the significance of the impact occurring, low.

Recommendations

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. No significant heritage sites or features were identified within the surveyed sections of Olyvenhouts Drift Settlement Erf 754. No further mitigation is required for the proposed development on this property. Therefore, from a heritage point of view, we recommend that the proposed agricultural development can continue.
2. The Middle Stone Age (MSA) and historical period cultural material identified on Olyvenhouts Drift Settlement Drift Erf 1074 is not conservation worthy, and no further mitigation is recommended with regards to these resources.
3. The graveyard site (ODS1074/001) is situated between development footprint 1 and 2 on Olyvenhouts Drift Settlement Drift Erf 1074 and should not be impacted by the development. The site is graded as IIIB and is of High Local Significance. It is therefore still recommended that the graves be fenced off with the inclusion of a 50m buffer/safety zone.

4. Due to the zero to low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area as the igneous rocks underlying the site are not fossiliferous. It is therefore recommended that the project be exempt from a full Paleontological Impact Assessment (Butler 2020).

5. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

TABLE OF CONTENTS

JAN ENGELBRECHT	3
HEIDI FIVAZ	3
EXECUTIVE SUMMARY	i
Project description	i
Findings and Impact on Heritage Resources	i
Recommendations.....	ii
TABLE OF FIGURES	v
ABBREVIATIONS	vi
GLOSSARY	vi
1. INTRODUCTION.....	1
1.1 Scope of study.....	1
1.2 Assumptions and limitations.....	2
2. TERMS OF REFERENCE	2
2.1. Statutory Requirements	3
2.1.1 General	3
2.1.2 National Heritage Resources Act 25 of 1999	3
2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments.....	3
2.1.4 Definitions of heritage resources.....	4
2.1.5 Management of Graves and Burial Grounds.....	4
3. STUDY APPROACH AND METHODOLOGY	6
3.1 Desktop study	6
3.1.1 Literature review.....	6
3.2 Field study	6
3.2.1 Systematic survey	6
3.2.2 Recording significant areas	7
3.2.3 Determining significance	7
3.2.4 Assessment of development impacts.....	8
3.3 Oral history	10
3.4 Report	10
4. PROJECT OVERVIEW.....	11
4.1 Technical information	11
4.2 Description of the affected environment.....	14
5. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND.....	16
5.1 Region.....	16
5.1.1 Stone Age.....	16
5.1.2 Historical period	17

5.2 Local	18
5.2.1 Stone Age.....	20
5.2.2 Historical period	20
5.2.3 Oral history	20
6. IDENTIFIED RESOURCES AND HERITAGE ASSESSMENT.....	21
6.1 Surveyed area	21
6.2 Identified heritage resources	21
6.3 Discussion	25
6.3.1 Archaeological features	25
6.3.3 Graves.....	26
6.3.4 Palaeontological resources	27
7. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT	28
8. RECOMMENDATIONS.....	29
9. CONCLUSION	30
10. BIBLIOGRAPHY	31
APPENDIX A	35
PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED DEVELOPMENT OF A PIPELINE, IRRIGATION DAM AND AGRICULTURAL EXPANSION ON ERVEN 1074 AND 754, OLYVENHOUTS DRIFT SETTLEMENT, UPINGTON, DAWID KRUIPER MUNICIPALITY, Z.F. MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE	35

TABLE OF FIGURES

Figure 1 Proposed development of irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Northern Cape Province.	12
Figure 2 Locality of the development footprint Olyvenhouts Drift Settlement, Upington, 1:50 000 Topo-cadastral map WGS2821AD, Chief Surveyor General.	13
Figure 3 Locality of the development footprint Olyvenhouts Drift Settlement, Upington, indicated on Google Earth Satellite imagery.....	13
Figure 4 Views of the affected development area.....	16
Figure 5 Detail of 1913 British military map describing the Olyvenhouts Drift pont, from which the Olyvenhouts Drift Settlement derives its name. (Source: https://digitalcollections.lib.uct.ac.za/collection/islandora-24919)	19
Figure 6 Survey tracks across the northern section of the development footprint Olyvenhouts Drift Settlement, Upington.	21
Figure 7 Distribution of identified heritage resources across Olyvenhouts Drift Settlement Erf 1074, Upington.....	24
Figure 8 Photographic selection of archaeological material recorded.....	26
Figure 9 Selection of photographs of the graveyard.....	27
Figure 10 SAHRIS PalaeoSensitivity Map indicating zero (grey) and moderate (green) palaeontological significance in the study area (https://sahris.sahra.org.za/map/palaeo).	28

ABBREVIATIONS

AIA:	Archaeological Impact Assessment
ASAPA:	Association of South African Professional Archaeologists
BIA:	Basic Impact Assessment
CRM:	Cultural Resource Management
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment*
EIA:	Early Iron Age*
EMP:	Environmental Management Plan
ESA:	Earlier Stone Age
GPS:	Global Positioning System
HIA:	Heritage Impact Assessment
LIA:	Late Iron Age
LSA:	Later Stone Age
MEC:	Member of the Executive Council
MIA:	Middle Iron Age
MPRDA:	Mineral and Petroleum Resources Development Act
MSA:	Middle Stone Age
NEMA:	National Environmental Management Act
NHRA:	National Heritage Resources Act
OWC:	Orange River Wine Cellars
PRHA:	Provincial Heritage Resource Agency
SADC:	Southern African Development Community
SAHRA:	South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations it must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological:	<p>material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;</p> <ul style="list-style-type: none"> – 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 is older than 100 years (as defined and protected by the National Heritage Resources Act (NHRA) (Act No. 25 of 1999) including any area within 10 m of such representation; – wrecks, being any vessel or aircraft, or any part thereof, which were wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), 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; – features, structures and artefacts associated with military history, which are older than 75 years and the sites on which they are found.
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Stone Age:	The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Earlier Stone Age:	>2 000 000 - >200 000 years ago
Middle Stone Age:	<300 000 - >20 000 years ago
Later Stone Age:	<40 000 - until the historical period
Iron Age:	(Early Farming Communities). Period covering the last 1800 years, when immigrant African farmer groups brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and herded cattle as well as sheep and goats. As they produced their own iron tools, archaeologists call this the Iron Age. Early Iron Age: AD 200 - AD 900 Middle Iron Age: AD 900 - AD 1300 Later Iron Age: AD 1300 - AD 1850
Historic:	Period of arrival of white settlers and colonial contact. AD 1500 to 1950
Historic building:	Structures 60 years and older.
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 (historic places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).
Heritage resources:	These mean any place or object of cultural significance, tangible or intangible.
Holocene:	The most recent geological period that 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 that contains such fossilised remains or traces
Cumulative impacts:	“Cumulative Impact”, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.
Mitigation:	Anticipating and preventing negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.
A ‘place’:	a site, area or region;

- a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
- a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
- an open space, including a public square, street or park; and
- in relation to the management of a place, includes the immediate surroundings of a place.

‘Public monuments and memorials’: mean all monuments and memorials—

- erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or
- which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual;

‘Structures’: any building, works, device or other facility made by people and which are fixed to land, and include any fixtures, fittings and equipment associated therewith.

1. INTRODUCTION

1.1 Scope of study

The project involves the proposed development of an, irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Dawid Kruiper Local Municipality, Z.F. Mgcawu District Municipality, Northern Cape. UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with the National Environmental Management Act 107 of 1998 (NEMA), and in compliance with Section 38 of the National Heritage Resources Act 25 of 1999 (NHRA), to conduct a cultural heritage assessment (AIA/HIA) of the development area.

The assessment aims to identify and report any heritage resources that may fall within the development footprint; to determine the impact of the proposed development on any sites, features, or objects of cultural heritage significance; to assess the significance of any identified resources; and to assist the developer in managing the documented heritage resources in an accountable manner, within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

South Africa's heritage resources are both rich and widely diverse, encompassing sites from all periods of human history. Resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes and living heritage. Their significance is based upon their aesthetic, architectural, historical, scientific, social, spiritual, linguistic, economic or technological values; their representation of a time or group; their rarity; and their sphere of influence.

The integrity and significance of heritage resources can be jeopardised by natural (e.g. erosion) and human (e.g. development) activities. In the case of human activities, a range of legislation exists to ensure the timeous and accurate identification and effective management of heritage resources for present and future generations.

The result of this investigation is presented within this heritage impact assessment report. It comprises the recording of heritage resources present/ absent and offers recommendations for the management of these resources within the context of the proposed development.

Depending on SAHRA's acceptance of this report, the developer will receive permission to proceed with the proposed development, taking into account any proposed mitigation measures.

1.2 Assumptions and limitations

It is assumed that the description of the proposed project, as provided by the client, is accurate. Furthermore, it is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is comprehensive and does not have to be repeated as part of the heritage impact assessment.

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects. Cultural significance is site-specific and relates to the content and context of the site.

Although all possible care has been taken during the comprehensive field survey and intensive desktop study to identify sites of cultural importance within the development areas, it is essential to note that some heritage sites may have been missed due to their subterranean nature, or due to dense vegetation cover. No subsurface investigation (i.e. excavations or sampling) were undertaken since a permit from SAHRA is required for such activities. Therefore, should any heritage features and/or objects such as architectural features, stone tool scatters, artefacts, human remains, or fossils be uncovered or observed during construction, operations must be stopped, and a qualified archaeologist contacted for an assessment of the find. Observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to assess the significance of the site (or material) in question.

2. TERMS OF REFERENCE

An HIA/ AIA must address the following key aspects:

- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- an assessment of the impact of the development on heritage resources;
- an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- plans for mitigation of any adverse effects during and after completion of the proposed development.

In addition, the HIA/AIA should comply with the requirements of NEMA, including providing the assumptions and limitations associated with the study; the details, qualifications and expertise of the person who prepared the report; and a statement of competency.

2.1. Statutory Requirements

2.1.1 General

The Constitution of the Republic of South Africa Act 108 of 1996 is the source of all legislation. Within the Constitution the Bill of Rights is fundamental, with the principle that the environment should be protected for present and future generations by preventing pollution, promoting conservation and practising ecologically sustainable development. With regard to spatial planning and related legislation at national and provincial levels the following legislation may be relevant:

- Physical Planning Act 125 of 1991
- Municipal Structures Act 117 of 1998
- Municipal Systems Act 32 of 2000
- Development Facilitation Act 67 of 1995 (DFA)

The identification, evaluation and management of heritage resources in South Africa are required and governed by the following legislation:

- National Environmental Management Act 107 of 1998 (NEMA)
- KwaZulu-Natal Heritage Act 4 of 2008 (KZNHA)
- National Heritage Resources Act 25 of 1999 (NHRA)
- Minerals and Petroleum Resources Development Act 28 of 2002 (MPRDA)

2.1.2 National Heritage Resources Act 25 of 1999

The NHRA established the South African Heritage Resources Agency (SAHRA) together with its Council to fulfil the following functions:

- co-ordinate and promote the management of heritage resources at national level;
- set norms and maintain essential national standards for the management of heritage resources in the Republic and to protect heritage resources of national significance;
- control the export of nationally significant heritage objects and the import into the Republic of cultural property illegally exported from foreign countries;
- enable the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources; and
- provide for the protection and management of conservation-worthy places and areas by local authorities.

2.1.3 Heritage Impact Assessments/Archaeological Impact Assessments

Section 38(1) of the NHRA of 1999 requires **the responsible heritage resources authority to notify the person who intends to undertake a development that fulfils the following criteria to submit an impact assessment report if there is reason to believe that heritage resources will be affected by such event:**

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- the construction of a bridge or similar structure exceeding 50m in length;
- any development or other activity that will change the character of a site—
 - exceeding 5000m² in extent; or
 - involving three or more existing erven or subdivisions thereof; or
 - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- the re-zoning of a site exceeding 10 000m² in extent; or

- any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

2.1.4 Definitions of heritage resources

The NHRA defines a heritage resource as any place or object of cultural significance, i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. These include, but are not limited to, the following wide range of places and objects:

- living heritage as defined in the National Heritage Council Act No 11 of 1999 (cultural tradition; oral history; performance; ritual; popular memory; skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships);
- Ecofacts (non-artefactual organic or environmental remains that may reveal aspects of past human activity; definition used in KwaZulu-Natal Heritage Act 2008);
- places, buildings, structures and equipment;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds;
- public monuments and memorials;
- sites of significance relating to the history of slavery in South Africa;
- movable objects, but excluding any object made by a living person; and
- battlefields.

Furthermore, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- its importance in the community, or pattern of South Africa's history;
- its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons; and
- its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.

2.1.5 Management of Graves and Burial Grounds

- **Graves younger than 60 years** are protected in terms of Section 2(1) of the Removal of Graves and Dead Bodies Ordinance 7 of 1925 as well as the Human Tissues Act 65 of 1983.
- **Graves older than 60 years, situated outside a formal cemetery administered by a local**

Authority are protected in terms of Section 36 of the NHRA as well as the Human Tissues Act of 1983. Accordingly, such graves are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of NHRA) is applicable to graves older than 60 years that are situated outside a formal cemetery administered by a local authority. Graves in the category located inside a formal cemetery administered by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

The protocol for the management of graves older than 60 years situated outside a formal cemetery administered by a local authority is detailed in Section 36 of the NHRA:

(3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3)(b) unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority—

(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and

(b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority—

(a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and

(b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

3. STUDY APPROACH AND METHODOLOGY

3.1 Desktop study

The first step in the methodology was to conduct a desktop study of the heritage background of the area and the site of the proposed development. This entailed the scoping and scanning of historical texts/records as well as previous heritage studies and research around the study area.

By incorporating data from previous CRM reports done in the area and an archival search, the study area is contextualised. The objective of this is to extract data and information on the area in question, looking at archaeological sites, historical sites and graves in the area.

No archaeological site data was available for the project area. A concise account of the archaeology and history of the broader study area was compiled from sources including those listed in the bibliography.

3.1.1 Literature review

A survey of the literature was undertaken to obtain background information regarding the area. Through researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that several other archaeological or historical studies had been performed within the broader vicinity of the study area. Sources consulted in this regard are indicated in the bibliography.

3.2 Field study

Phase 1 (AIA/HIA) requires the completion of a field study to establish and ensure the following:

3.2.1 Systematic survey

A systematic survey of the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest, was completed.

UBIQUE Heritage Consultants inspected the proposed development and surrounding areas on the 13th of February 2020 and completed a controlled-exclusive, pre-planned, pedestrian survey. We conducted an inspection of the surface of the ground, wherever the surface was visible. This was done with no substantial attempt to clear brush, sand, deadfall, leaves or other material that may cover the surface and with no effort to look beneath the surface beyond the inspection of rodent burrows, cut banks and other exposures fortuitously observed.

The survey was tracked with a handheld Garmin global positioning unit (Garmin eTrex 10).

3.2.2 Recording significant areas

GPS points of identified significant areas were recorded with a handheld Garmin global positioning unit (Garmin eTrex 10). Photographs were taken with a Canon Ixus 190 20-megapixel camera. Detailed field notes were taken to describe observations. The layout of the area and plotted GPS points, tracks and coordinates, were transferred to Google Earth and QGIS and maps were created.

3.2.3 Determining significance

Levels of significance of the various types of heritage resources observed and recorded in the project area will be determined to the following criteria:

Cultural significance:

- Low A cultural object being found out of context, not being part of a site or without any related feature/structure in its surroundings.
- Medium Any site, structure or feature being regarded less important due to several factors, such as date and frequency. Likewise, any important object found out of context.
- High Any site, structure or feature regarded as important because of its age or uniqueness. Graves are always categorized as of a high importance. Likewise, any important object found within a specific context.

Heritage significance:

- Grade I Heritage resources with exceptional qualities to the extent that they are of national significance
- Grade II Heritage resources with qualities giving it provincial or regional importance although it may form part of the national estate
- Grade III Other heritage resources of local importance and therefore worthy of Conservation

Field ratings:

- i. National Grade I significance should be managed as part of the national estate
- ii. Provincial Grade II significance should be managed as part of the provincial estate
- iii. Local Grade IIIA should be included in the heritage register and not be mitigated (high significance)
- iv. Local Grade IIIB should be included in the heritage register and may be mitigated (high/ medium significance)

- | | | |
|------|-----------------------------|---|
| v. | General protection A (IV A) | site should be mitigated before destruction (high/ medium significance) |
| vi. | General protection B (IV B) | site should be recorded before destruction (medium significance) |
| vii. | General protection C (IV C) | phase 1 is seen as sufficient recording and it may be demolished (low significance) |

Heritage value, statement of significance:

- a. its importance in the community, or pattern of South Africa's history;
- b. its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- c. its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- d. its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- e. its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- f. its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- g. its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- h. its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- i. sites of significance relating to the history of slavery in South Africa.

3.2.4 Assessment of development impacts

A heritage resource impact may be defined broadly as the net change, either beneficial or adverse, between the integrity of a heritage site with and without the proposed development. Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource, by minimising natural site erosion or facilitating non-destructive public use, for example. More commonly, development impacts are of an adverse nature and can include:

- destruction or alteration of all or part of a heritage site;
- isolation of a site from its natural setting; and / or
- introduction of physical, chemical or visual elements that are out of character with the heritage resource and its setting.

Beneficial and adverse impacts can be direct or indirect, as well as cumulative, as implied by the examples. Although indirect impacts may be more difficult to foresee, assess and quantify, they must form part of the assessment process. The following assessment criteria have been used to

assess the impacts of the proposed development on possible identified heritage resources:

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the type of effect the construction, operation and management of the proposed development would have on the heritage resource.
	Negative	
	Neutral	
Extent	Low	Site-specific, affects only the development footprint.
	Medium	Local (limited to the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius);
	High	Regional (beyond a 10 km radius) to national.
Duration	Low	0-4 years (i.e. duration of construction phase).
	Medium	5-10 years.
	High	More than 10 years to permanent.
Intensity	Low	Where the impact affects the heritage resource in such a way that its significance and value are minimally affected.
	Medium	Where the heritage resource is altered, and its significance and value are measurably reduced.
	High	Where the heritage resource is altered or destroyed to the extent that its significance and value cease to exist.
Potential for impact on irreplaceable resources	Low	No irreplaceable resources will be impacted.
	Medium	Resources that will be impacted can be replaced, with effort.
	High	There is no potential for replacing a particular vulnerable resource that will be impacted.
Consequence, (a combination of extent, duration, intensity, and the potential for impact on irreplaceable resources).	Low	A combination of any of the following: - Intensity, duration, extent and impact on irreplaceable resources are all rated low. - Intensity is low and up to two of the other criteria are rated medium. - Intensity is medium and all three other criteria are rated low.
	Medium	Intensity is medium and at least two of the other criteria are rated medium.
	High	Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration. Intensity is rated high, with all the other criteria being rated medium or higher.

Criteria	Rating Scales	Notes
Probability (the likelihood of the impact occurring)	Low	It is highly unlikely or less than 50 % likely that an impact will occur.
	Medium	It is between 50 and 70 % certain that the impact will occur.
	High	It is more than 75 % certain that the impact will occur, or it is definite that the impact will occur.
Significance (all impacts including potential cumulative impacts)	Low	Low consequence and low probability. Low consequence and medium probability. Low consequence and high probability.
	Medium	Medium consequence and low probability. Medium consequence and medium probability. Medium consequence and high probability. High consequence and low probability.
	High	High consequence and medium probability. High consequence and high probability.

3.3 Oral history

Where possible, people from local communities were interviewed to obtain information relating to the surveyed area.

3.4 Report

The results of the desktop research and field survey are compiled in this report. The identified heritage resources and anticipated and cumulative impacts that the development of the proposed project may have on the identified heritage resources will be presented objectively. Alternatives, should any significant sites be impacted adversely by the proposed project, are offered. All effort will be made to ensure that all studies, assessments and results comply with the relevant legislation and the code of ethics and guidelines of the Association of South African Professional Archaeologists (ASAPA). The report aims to assist the developer in managing the documented heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

4. PROJECT OVERVIEW

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc as independent heritage specialists in accordance with Section 38 of the NHRA and the National Environmental Management Act 107 of 1998 (NEMA), to conduct a cultural heritage assessment to determine the impact of the proposed development of pipeline, irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, on any sites, features, or objects of cultural heritage significance.

The project involves the development of an irrigation dam (reservoir) and the establishment of vineyards on three different plots. The proposed development sizes are as follow:

Erf 1074	- Dam development	1.2 ha
	- Development 1	10.6 ha
	- Development 2	8.0 ha
Erf 754	- Development 3	13.4 ha

No roads will be constructed as existing access roads will be used to gain access to the site. The site coordinates are 28°27'45.02"S, 21°17'2.87"E.

4.1 Technical information

Project description	
Project name	The proposed development of an irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape.
Description	The project involves the development of an irrigation dam (reservoir) and the establishment of additional vineyards.
Developer	
Turksvy Fotos Kunste & Rame cc	
Contact information	Email: david@merwelandgoed.co.za
Development type	Agriculture
Landowner	
Erf 1074- Blue Sands Trading 158 cc, Erf 754- Turksvy Fotos Kunste & Rame cc	
Contact information	As above
Consultants	
Environmental	EnviroAfrica cc.
Heritage and archaeological	UBIQUE Heritage Consultants
Paleontological	Banzai Environmental
Property details	
Province	Northern Cape
District municipality	Z.F. Mgcau
Local municipality	Dawid Kruiper

Topo-cadastral map	1:50 000 2821AD
Farm name	Olyvenhouts Drift Settlement Erven 1074 and 754
Closest town	Upington
GPS Co-ordinates	28° 27' 45.02"S, 21° 17' 2.87"E.
Property size	
Development footprint size	33.2 ha
Land use	
Previous	Agriculture and quarrying/mining
Current	Agriculture
Rezoning required	No
Sub-division of land	No
Development criteria in terms of Section 38(1) NHRA	
	Yes/No
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	Yes
Construction of bridge or similar structure exceeding 50m in length.	No
Construction exceeding 5000m ² .	Yes
Development involving three or more existing erven or subdivisions.	Yes
Development involving three or more erven or divisions that have been consolidated within the past five years.	No
Rezoning of site exceeding 10 000m ² .	No
Any other development category, public open space, squares, parks, recreation grounds.	No

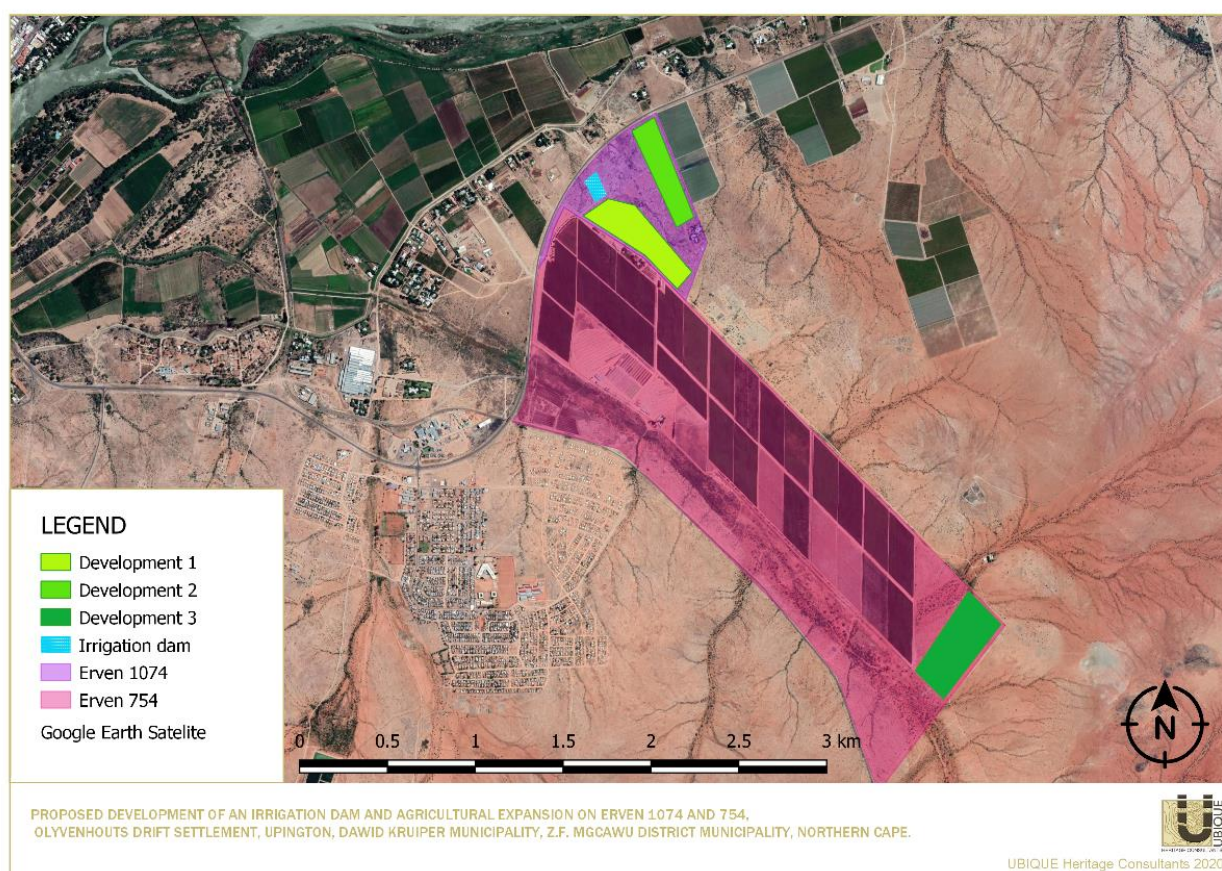


Figure 1 Proposed development of irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Northern Cape Province.

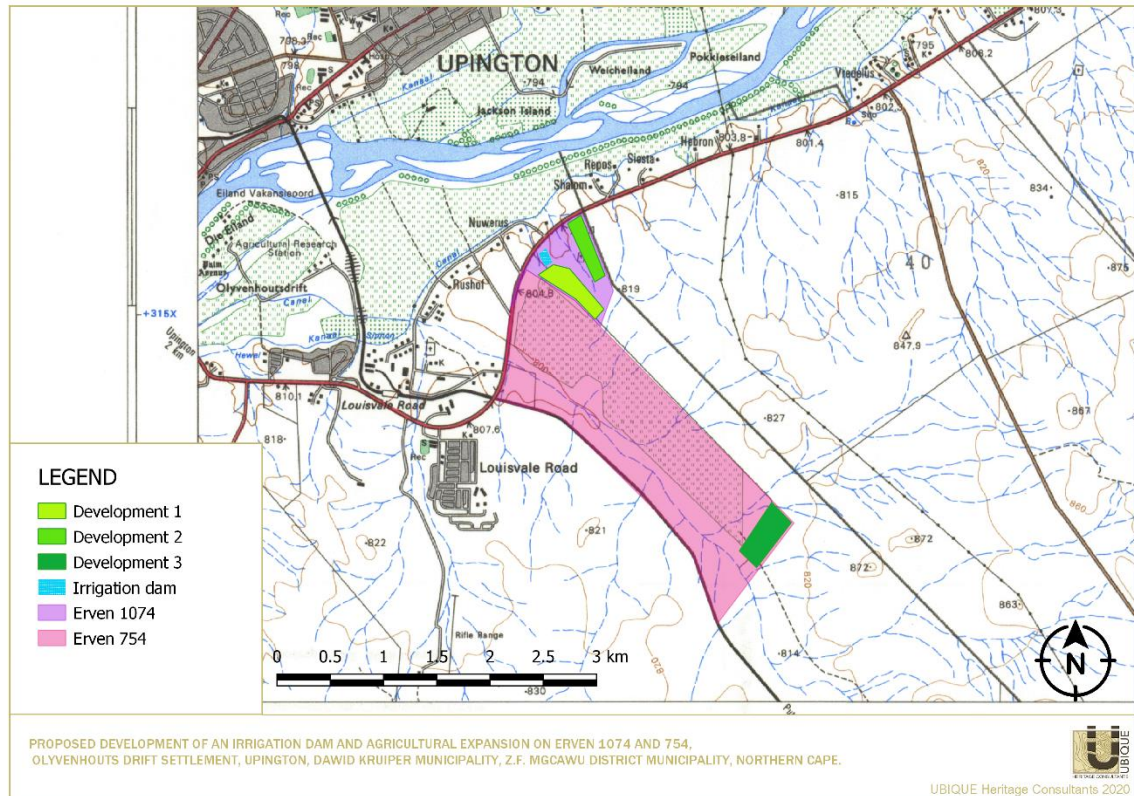


Figure 2 Locality of the development footprint Olyvenhouts Drift Settlement, Upington, 1:50 000 Topo-cadastral map WGS2821AD, Chief Surveyor General.

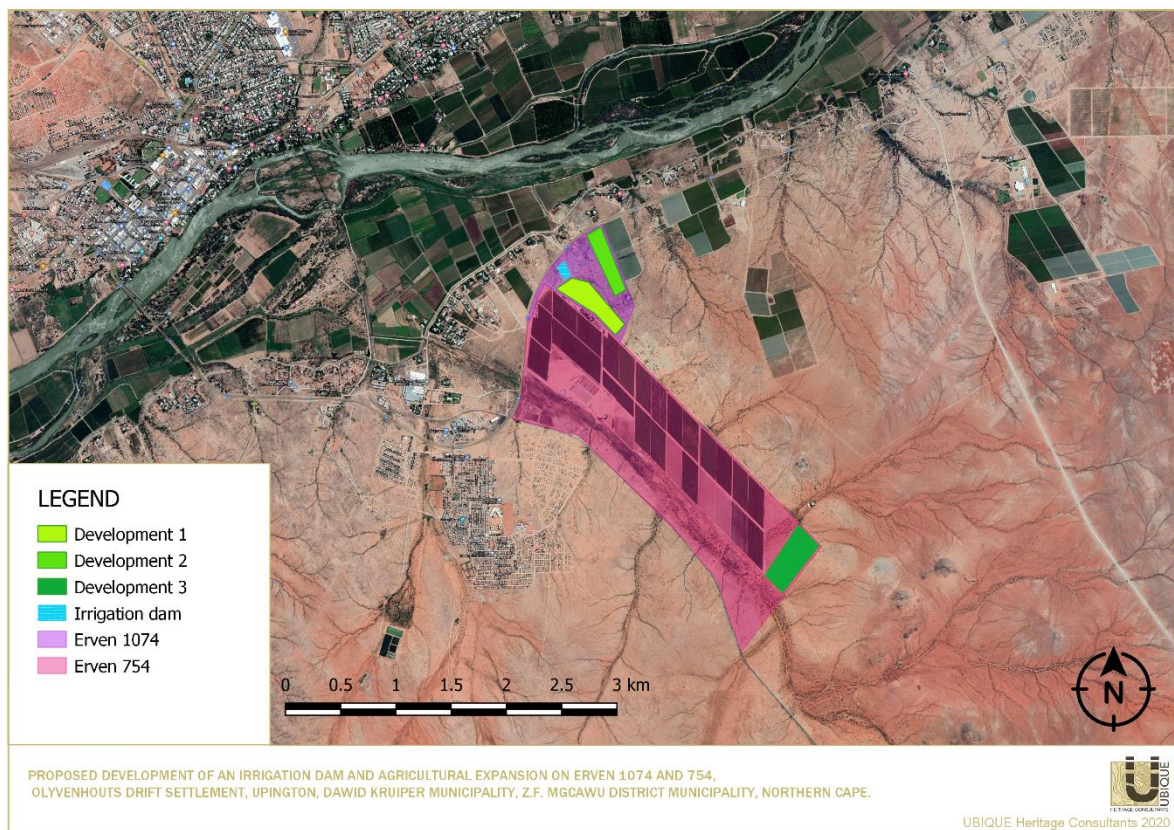


Figure 3 Locality of the development footprint Olyvenhouts Drift Settlement, Upington, indicated on Google Earth Satellite imagery.

4.2 Description of the affected environment

The northern boundary of the development area falls within the Lower Gariep Alluvial Vegetation type, while the southern sections of the development footprint lie within typical Bushmanland Arid Grassland. The Lower Gariep Alluvial Vegetation is characterised by flat alluvial terraces, sandbanks, and riverine islands which are subject to floods, especially in the summer. Bushmanland Arid Grassland's northern border (in the vicinity of Upington) consist of a mixture of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonias Duneveld, featuring extensive irregular plains red-yellow apedal soils on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses and some low shrubs in places (Mucina & Rutherford 2006). Various types of vegetation cover the site footprint: Camel Thorn trees (*Acacia erioloba*), Black Thorn trees (*Acacia mellifera*), Three Thorn/Driedoring (*Rhigozum trichotomum*), Skaapbossie (*Aizoon schellenbergii*), Silky Bushman grass (*Stipagrostis uniplumis*), Kortbeen Boesmansgras (*Stipagrostis obtuse*), Pencil milkbush (*Euphorbia lignose*) and Hereroland aloe (*Aloe hereroensis*). There are predominantly quartz, quartzite, dolomite and shale, with some isolated calcrete outcrops across the footprint.

The area earmarked for the dam development is mostly flat in the north with a gradual downward slope from the south towards the north. The dam site consists mainly of klipveld and very rocky terrain. Anthropogenic disturbances occur around the large quarry/burrow pit on the northern half of the proposed dam footprint adjacent to the N10, with traces of the associated mining and excavation activities, as well as dumped building rubble, old construction material, discarded equipment and refuse. According to the current owner the old quarry was previously used for the construction of the N10 National road. At least two prominent dry riverine flow through the site from south to north towards the existing quarry on the site. Minor dry streams run southwest to northeast through the site.

Established vineyards exist on this footprint. No identifiable natural waterways are present on the surface, but a human-made canal crosses the pipeline site from east to west. This canal serves as irrigation for agriculture in the region. An existing pipeline from the Orange river feeds the channel, from which the farmers irrigate their lands by pumping water from several pump stations along the canal. The proposed development will rely on this existing infrastructure for filling and refilling of the proposed dam and irrigation of the proposed agricultural development.

On the most southern site of the proposed agricultural development, the terrain is flat and sandy, with minor rocky outcrops and klipveld. An excavated trench runs from west to east through the site, probably for the pipeline/irrigation development. One main waterway or dry riverine flows from west to east. Waterways are controlled by contour development, and the site is adjacent to existing agricultural developments (vineyard). Access roads to this site are already established.

The development footprints are bounded in the west by the N10 National road, gravel access roads and the Louisvale Settlement, and towards the east, neighbouring farms. In the north, the development is circumscribed by the N10 National road, the existing irrigation canal and the Orange River, while adjacent farm boundaries border the development in the south.



Existing canal





Existing pump station and irrigation infrastructure



Existing pump station and irrigation infrastructure

Figure 4 Views of the affected development area.

5. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

5.1 Region

The Northern Cape is rich in archaeological sites and landscapes that reflect the complex South African heritage from the Stone Age to Colonial history.

5.1.1 Stone Age

The Stone Age is the period in human history when lithic material was mainly used to produce tools (Coertze & Coertze 1996). In South Africa, the Stone Age can be divided into three periods. It is, however, important to note that dates are relative and only provide a broad framework for interpretation. The division of the Stone Age, according to Lombard et al. (2012) is as follows:

Earlier Stone Age:	>2 000 000 - >200 000 years ago
Middle Stone Age:	<300 000 - >20 000 years ago
Later Stone Age:	<40 000 - until the historical period.

Each of the sub-divisions is formed by a group of industries where the assemblages share attributes or common traditions (Lombard et al. 2012). Prominent sites that exemplify these periods in the Nama-Karoo Biome are Rooidam and Bundu Farm (Earlier Stone Age and Middle Stone Age), and Biesje Poort 2, Bokvasmaak 3, Melkboom 1, Vlermuigat, and Jagtpan 7 (Later Stone Age) (Lombard et al. 2012).

Within the region, Stone Age sites and complexes have been, and are still being investigated in some detail. This includes, but are not limited to, the landscape near Kathu, where numerous Stone Age sites have been documented and excavated, representing the longest preserved lithostratigraphic and archaeological sequence of human occupation at the pan through the ESA, MSA, and LSA and with evidence for 500 000-year-old hafted stone points; ancient specularite working (and mining) on the eastern side of Postmasburg, Doornfontein; and associated Ceramic

Later Stone Age material, and also the older transitional ESA/MSA Fauresmith sites at Lyly Feld, Demaneng, Mashweneng, King, Rust & Vrede, Paling, Gloucester and Mount Huxley (Beaumont 2004; Beaumont 2013; Beaumont & Morris 1990; Beaumont & Vogel 2006; Morris 2005; Morris & Beaumont 2004; Porat et al. 2010; Thackeray et al. 1983; Walker et al. 2014; Wilkins et al. 2012).

Beaumont et al. (1995) commented that thousands of square kilometres of Bushmanland are covered by low-density lithic scatters. It is therefore not surprising that Stone Age sites and lithic scatters were identified by CRM practitioners between the Garona substation and the Gariep/Orange River in numerous surveys conducted during the recent years. Scatters of MSA material have been recorded close to Griekwastad, Hotazel, Postmasburg and Kenhardt, Pofadder, Marydale, and in the Upington district (Dreyer 2006, 2012, 2014; Pelsers & Lombard 2013; PGS Heritage 2009, 2010; Webley 2013). MSA and LSA tools, as well as rock engravings, were also found at Putsonderwater, Beeshoek and Bruce (Morris 2005; Snyman 2000; Van Vollenhoven 2012b; Van Vollenhoven 2014).

Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites since these areas were utilised for base camps close to water and hunting ranges. If any such features occur in the study area, Stone Age manifestations can be anticipated (Lombard 2011).

5.1.2 Historical period

The historical period within the region coincides with the incursion of white traders, hunters, explorers, and missionaries into the interior of South Africa. Buildings and structures associated with the early missionaries, travellers, and traders such as PJ Truter's and William Somerville (arriving in 1801), Donovan, Burchell and Campbell, James Read (arriving around 1870) William Sanderson, John Ryan and John Ludwig's (De Jong 2010; Snyman 2000) arrival during the 19th century, and the settlement of the first white farmers and towns, are still evident in the Northern Cape. Numerous heritage reports that provide a synthesis of the incursions of travellers, missionaries and the early European settlers have been captured on the SAHRIS database.

San hunter-gatherer groups utilised the landscape for thousands of years, and Khoi herders moved into South Africa with their cattle and sheep approximately 2000 years ago. With the arrival of the Dutch settlers in the Cape in the mid-17th century, clashes between the Europeans and Khoi tribes in the Cape Peninsula resulted in the Goringhaiqua and Goraxouqua migrating north towards the Gariep/Orange River in 1680. These tribes became collectively known as the Korannas, living as small tribal entities in separate areas (Penn 2005).

According to Breutz (1953, 1954), and Van Warmelo (1935), several Batswana tribes, including the different Thlaping and Thlaro sections as well as other smaller groups, take their 18th and 19th-century roots back to the area around Groblershoop, Olifantshoek, the Langeberg (Majeng) and Korannaberg ranges in the western part of the region. After Britain annexed Bechuanaland in 1885, the land of the indigenous inhabitants was limited to a few reserves. In 1895, when British Bechuanaland was incorporated into the Cape Colony, the land inside the reserves remained the property of the Tswana and could only be alienated with the consent of the British Secretary of State.

Because of its distance from the Cape Colony, this arid part of South Africa's interior was generally not colonised until relatively recent. According to history, the remote northern reaches of the Cape Colony were home to cattle rushers, gunrunners, river pirates and various manner of outlaws. Distribution of land to colonial farmers only occurred from the 1880s onwards when Government-owned land was surveyed, divided into farms, and transferred to farmers. More permanent large-scale settlement however only started in the late 1920s, and the first farmsteads were possibly built during this period. The region remained sparsely populated until the advent of the 20th century (De Jong 2010, Penn 2005).

The region has been the backdrop to various incidents of conflict. The arrival of large numbers of Great Trek Boers from the Cape Colony to the borders of Bechuanaland and Griqualand West in 1836 caused friction with many Tswana groups and the missionaries of the London Mission Society. The conflict between Boer and Tswana communities escalated in the 1860s and 1870s when the Korana and Griqua communities and the British government became involved. The Northern Cape was critical in the Anglo-Boer War (1899-1902), and major battles took place within 120 km of Kimberley, including the battle of Magersfontein. Boer guerrilla forces roamed the entire Northern Cape region and skirmishes between Boer and Brits were regular occurrences. Furthermore, many graves in the region tell the story of battles fought during the 1914 Rebellion (Hopkins 1978).

5.2 Local

During 1778, Swedish-born traveller and explorer Hendrik Wikar reached the middle and lower reaches of the Orange River after a long land journey that started in Cape Town. As a deserter from the service of the Dutch East India Company, Wikar spent several years within the area and compiled a report of his experiences in exchange for a pardon (Ross 1975). He documented his encounters with Khoisan communities who called themselves the *Einiqua*, or *River People*. The *Einiqua* were divided into three "kraals": the *Namnykoa* near the Augrabies Falls, the *Kaukoa* on islands west of Keimoes, and the *Aukokoa* of Kanoneiland and other islands to the east. Their kraals consisted of a considerable amount of sheep and cattle, and they collected plants, hunted game, and cultivated dagga but no other crops, according to Wikar (Ross 1975). Amongst the pastoralist communities living on the islands were the *Anoe eis* people whom Wikar characterised as "Bushmen". They possessed no domesticated stock, subsisted by fishing, game-trapping, hunting and the gathering of plant foods (Morris & Beaumont 1991). Colonel Robert Jacob Gordon who visited the area in 1779, however, remarked that they were actually *Einiqua* (i.e. Khoi) who had "lost their cattle as a result of an argument with the *Namneiqua* village (Morris & Beaumont 1991).

During the late 17th century, Korana groups moving from the south-western Cape to escape pressures from the European settlers trekked along the Gariep and settled among the Nama herders and groups of San hunter-gatherers living on the river islands and shores. The Korana or Kora were nomadic Khoikhoi groups that had become well-armed, accomplished horsemen, and some of these groups frequently raided the farms and communities south of the Gariep/Orange River. The Korana Wars of 1869 and 1878 were the result of increased competition for land and resources between the Trekboers and Khoi and San groups. Along with mounted Boers and Basters, the Frontier Armed and Mounted Police and a small detachment of the Royal Artillery eventually managed to scatter and subjugate the Korana 'raider' groups. Klaas Lukas, a prominent

Korana chief situated at Olyvenhouts Drift (Upington), played an essential role in defeating the Korana raiding groups with the support of the majority of the Korana, the Nama Afrikanders led by Jacobus Afrikander and several Griqua rebels under Gamka Pienaar. The Korana who rejected a future under colonial rule trekked further into the Kalahari. The Cape Government settled the Basters near Upington to form a buffer between the Boers and the Korana. Today, the Korana have almost completely disappeared as a separate group through assimilation with the population in the area (<https://www.sahistory.org.za/article/kora>).

Olyvenhouts Drift was the location of a mission station founded in 1871 by the German missionary Rev Schröder and named after the many wild olivewood trees growing in the area around the ford. The town was renamed to Upington in 1884, after Sir Thomas Upington, the Attorney-General of the Cape Colony. Rev Schröder has been credited with the building of the irrigation canal from 1883 to 1885, but current views attribute the original idea to a local inhabitant by the name of Abraham September. By 1884, 77 farms were being irrigated by the canal (Orton 2015; Van Schalkwyk 2014b).

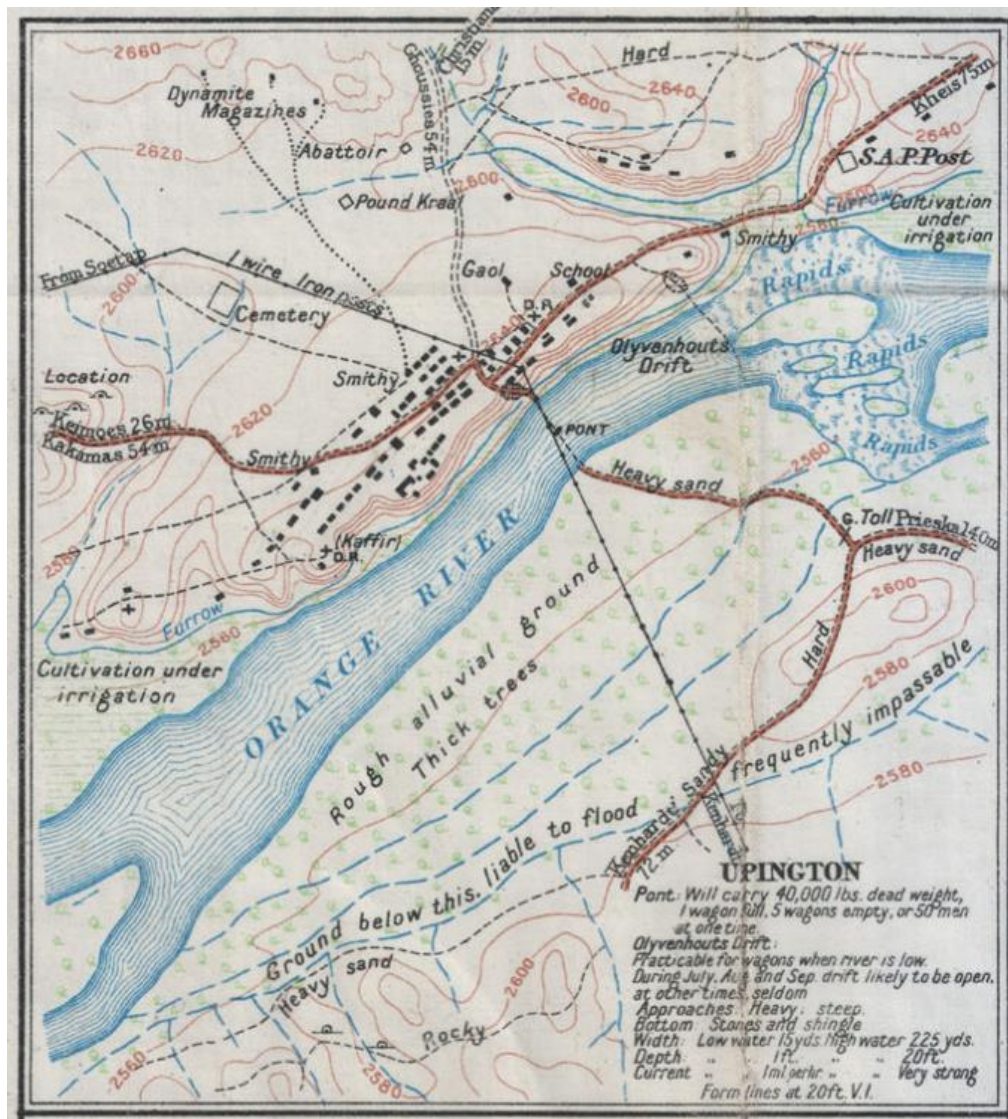


Figure 5 Detail of 1913 British military map describing the Olyvenhouts Drift pont, from which the Olyvenhouts Drift Settlement derives its name. (Source: <https://digitalcollections.lib.uct.ac.za/collection/islandora-24919>)

A large amount of Heritage Impact Assessments has been conducted in the wider Upington area. These include, but are not limited to, studies by Beaumont (2006a; 2006b; 2006c), De Jong & Van Schalkwyk (2010), Dreyer (2013), Kaplan (2013a; 2013b; 2015; 2016), Kruger (2016), Morris (2010; 2013; 2014; 2018), Nilssen (2012), Orton (2015), and Van Schalkwyk (2014a; 2014b; 2014c).

5.2.1 Stone Age

Scatters of stone artefacts around Louisvale, towards the west of the proposed development footprint have been reported by ACRM (2016b), Beaumont (2006b), Morris (2018), and Van Schalkwyk (2014c), to name a few. The lithics documented are predominantly associated with the MSA, with some localities attributed to the LSA. The incidences of lithics have little to no context and are primarily described as of poor preservation and of low significance. The lithic assemblages consist of cores and flakes with very few specific tools. ACRM (2016b) noted that 96% of the tools documented are made from locally available, fine-grained banded ironstone, which is a favoured raw material on many sites in the Northern Cape. The remainder is in indurated shale, chert, quartzite and quartz, and hornfels.

To the west of the proposed development on Erf 755, ACRM (2016a) recorded more than 75 stone artefacts with the majority of the finds attributed to the Later Stone Age (LSA), with a handful of Middle Stone Age (MSA) implements. The lithic assemblages comprised of modified (i.e. utilized and retouched) flakes and chunks, including a few round cores, a quartz core and a quartzite MSA core, and two scrapers. The majority of the tools recorded (utilized/modified flakes, chunks & a few cores) most likely represent discarded flakes or flake debris. Tools were made from banded ironstone, indurated shale, quartz and quartzite.

Approximately 1.7km south-east of the proposed irrigation dam, Orton (2015) identified isolated occurrences of lithic material that formed part of the background scatter in the area. He recorded two places where it appears that Later Stone Age people may have camped close to a stream, but both scatters were very low density and not of further concern.

5.2.2 Historical period

Either due to sparse population of the area or the ephemeral nature of military encampments from the historical period, very few cultural material or sites have been documented by heritage specialists in the vicinity of the proposed development.

5.2.3 Oral history

No interviews with locals were conducted regarding the history of the area.

6. IDENTIFIED RESOURCES AND HERITAGE ASSESSMENT

6.1 Surveyed area

The area surveyed for the impact assessment was dictated by the Google Earth map of the development footprints provided by the client.

The pedestrian survey was conducted in predominantly 30-50 m transects. Areas that have been severely disturbed were surveyed in wider transects or only scoped. The survey extended beyond the development footprints to take into consideration the full impact of the development by investigating probable areas on the landscape adjacent to the development footprints that may contain heritage.

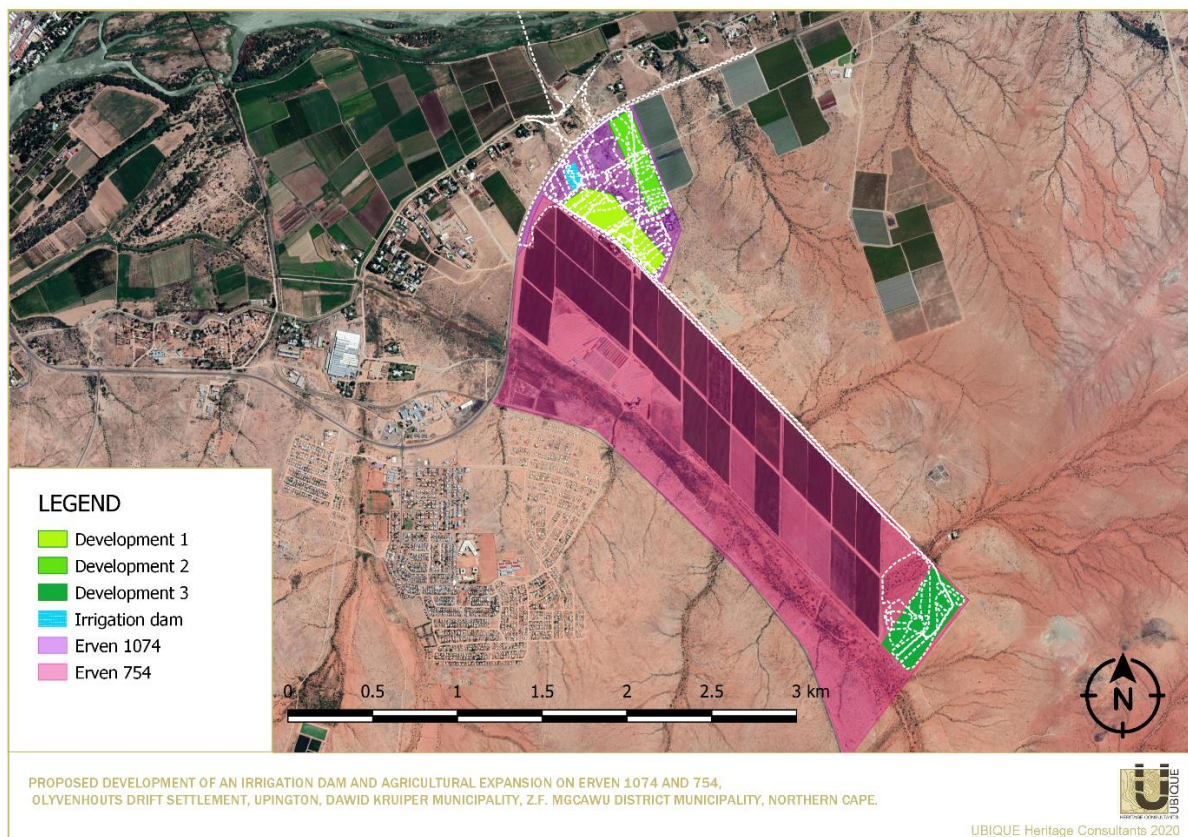


Figure 6 Survey tracks across the development footprints, Olyvenhouts Drift Settlement, Upington.

6.2 Identified heritage resources

Middle Stone Age (MSA) material, historical period cultural material, and a graveyard were found on Olyvenhouts Drift Settlement Drift Erf 1074. No heritage resources were recorded on the surveyed sections of Olyvenhouts Drift Settlement Erf 754.

RESOURCES IDENTIFIED ON OLYVENHOUTS DRIFT SETTLEMENT ERF 1074 (ODS1074)

Site Name	Description	Period	Location	Field rating/ Significance
Stone Age				
ODS1074/004	Type lithic/s	MSA	28° 27' 44.4" S 21° 17' 10.1" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/006	Type lithic/s	MSA	28° 27' 41.5" S 21° 17' 09.7" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/007	Type lithic/s	MSA	28° 27' 40.9" S 21° 17' 13.5" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/008	Type lithics/s	MSA	28° 27' 50.9" S 21° 17' 16.0" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/009	Type lithics/s	MSA	28° 27' 52.4" S 21° 17' 12.0" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/010	Type lithics/s	MSA	28° 27' 52.4" S 21° 17' 12.0" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/011	Type lithics/s	MSA	28° 27' 53.0" S 21° 17' 14.9" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/012	Type lithics/s	MSA	28° 27' 54.0" S 21° 17' 12.0" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			
ODS1074/013	Type lithics/s	MSA	28° 27' 55.2" S 21° 17' 08.9" E	Field Rating IV C Low significance
	Raw material			
	N in m².			
	Context			
	Additional			

Site Name	Description		Period	Location	Field rating/ Significance
ODS1074/014	Type lithics/s	Core, chunks, blade, flakes, chips. Debris	MSA	28° 27' 55.8" S 21° 17' 12.3" E	Field Rating IV C Low significance
	Raw material	BIF and Dolomite			
	N in m².	13/100m²			
	Context	Possible micro knapping site			
	Additional	Surface scatter			
ODS1074/015	Type lithics/s	Core, chunks, flakes. Debris	MSA	28° 27' 56.6" S 21° 17' 16.5" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	13/100m²			
	Context	Possible micro knapping site			
	Additional	Surface scatter			
ODS1074/017	Type lithics/s	Chips, chunks, blades, at least one scraper. Debris	MSA	28° 28' 00.1" S 21° 17' 11.1" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	25/100m²			
	Context	Possible micro knapping site			
	Additional	Surface scatter.			
ODS1074/019	Type lithics/s	Chunks and Flakes	MSA	28° 28' 02.6" S 21° 17' 17.4" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	4/100m²			
	Context	Surface scatter. No context			
	Additional	None			
ODS1074/020	Type lithics/s	Scraper, small core, chunk, flake. Debris and scraper	MSA	28° 27' 53.8" S 21° 17' 12.4" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	4/100m²			
	Context	Surface scatter. No context			
	Additional	Alluvial. Dislocated from the current location by water/ riverine during raining season			
ODS1074/022	Type lithics/s	Core, chunks, flakes. Debris	MSA	28° 27' 44.9" S 21° 17' 05.8" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	5/100m²			
	Context	Surface scatter. No context			
	Additional	None			
ODS1074/023	Type lithics/s	Core and chunk	MSA	28° 27' 34.6" S 21° 17' 10.2" E	Field Rating IV C Low significance
	Raw material	BIF			
	N in m².	2/100m²			
	Context	Surface scatter. No context			
	Additional	None			
ODS1074/024	Type lithics/s	Chunks, blade, cores, flakes, scrapers, chips. Debris and tools.	MSA	28° 27' 48.1" S 21° 16' 53.4" E	Field Rating IV C Low significance
	Raw material	BIF and CCS			
	N in m².	12/100m²			
	Context	Possible micro knapping site.			
	Additional	Surface scatter			
Historical					
ODS1074/002 and ODS1074/003	Type of feature	Surface scatter	Ca 1890s	28° 27' 41.5" S 21° 17' 13.6" E	Field Rating IV C Low significance
	Material	Hole-in-cap tins			
	N in m².	N=7 in 100 m²			
	Context	None			
	Additional				
ODS1074/005	Type of feature	Surface scatter	Ca 1890s		Field Rating IV C

Site Name	Description		Period	Location	Field rating/ Significance
	Material	Hole-in-cap tins		28° 27' 52.2" S 21° 17' 06.9" E	Low significance
	N in m².	N=1 in 100 m²			
	Context	None			
	Additional				
ODS1074/016	Type of feature	Surface scatter	Ca 1890s	28° 28' 00.1" S 21° 17' 11.1" E	Field Rating IV C Low significance
	Material	Hole-in-cap tins			
	N in m².	N=1 in 500 m²			
	Context	None			
	Additional				
Graves					
ODS/1074-001	Grave markers	Several graves have stone headstones without markings. Graves are marked with stones quartz and quartzite. Adult and children's graves present.	Ca >1878	28° 27' 46.3" S 21° 17' 05.3" E	Field Rating of Local Grade IIIB High/medium significance
	Inscription	None			
	Graves' Orientation	East/West			
	Dimensions/ Extent	60m x 10m layout orientated North to South			

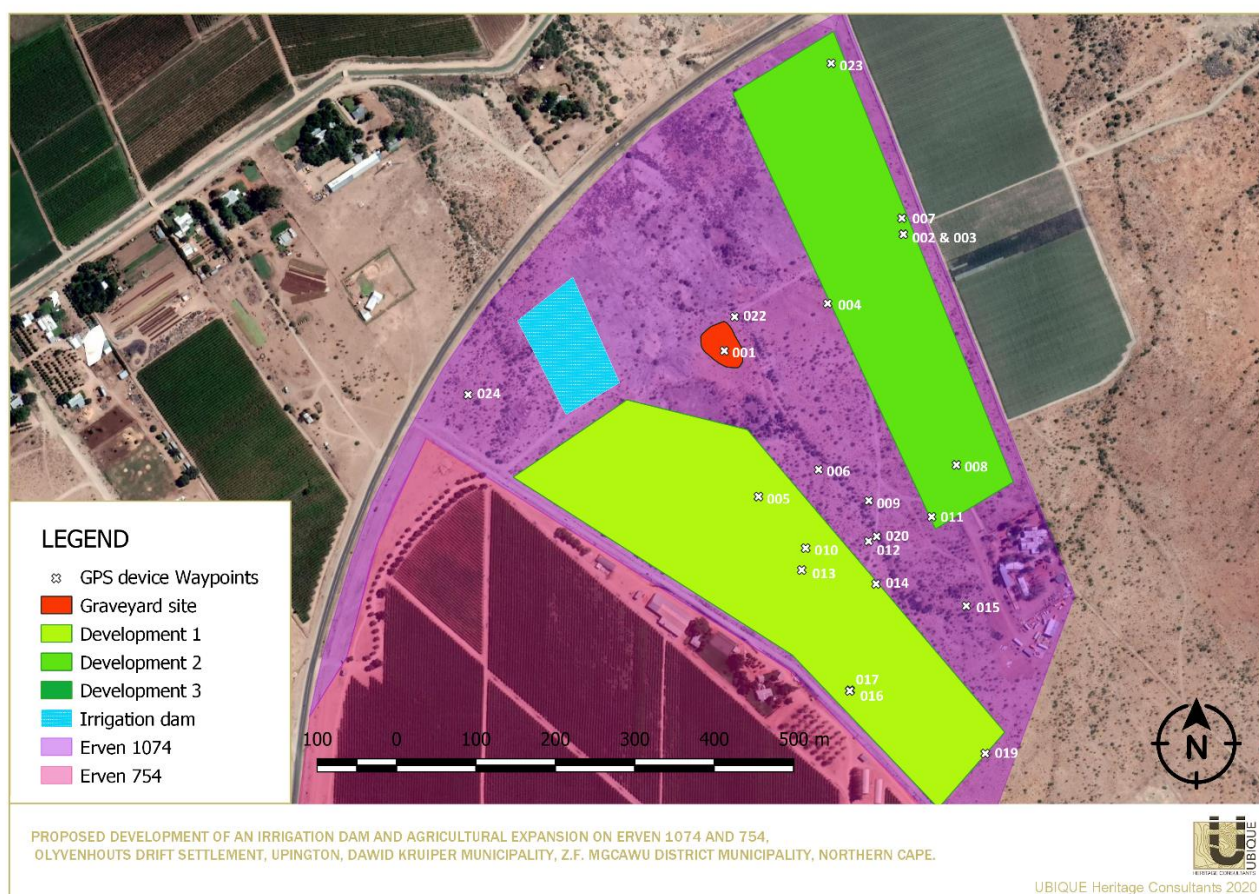


Figure 7 Distribution of identified heritage resources across Olyvenhouts Drift Settlement Erf 1074, Upington.

6.3 Discussion

6.3.1 Archaeological features

Seventeen occurrences of lithic material were recorded across the surveyed area on or in close vicinity to the development footprints on Olyvenhouts Drift Erf 1074 (Sites ODS1074/004, ODS1074/006, ODS1074/007, ODS1074/008, ODS1074/009, ODS1074/010, ODS1074/011, ODS1074/012, ODS1074/013, ODS1074/014, ODS1074/015, ODS1074/017, ODS1074/019, ODS1074/020, ODS1074/022, ODS1074/023, and ODS1074/024).

The recorded lithic material consists of low- to medium-density background scatters with cores, scrapers, a bladelet, untrimmed flakes, chips and knapping debris, made predominantly from BIF (Banded Ironstone Formation), with a few isolated pieces produced from CCS (Crypto-Crystalline Silicates) and dolomite pieces. At sites ODS1074/010, ODS1074/013, ODS1074/014, ODS1074/015, ODS1074/017, and ODS1074/024, the increased concentration of knapping debris together with discarded formal tools could point to minor stone tool productions sites. However, both environmental and anthropogenic factors could have played a role in horizontal dispersal and concentration of material. Across the board, the documented lithics are attributed to the MSA. The found lithic material shows various degrees of weathering and are without substantial archaeological context or matrix, and are therefore deemed of minor scientific importance, and not conservation worthy (NCW).

Four occurrences of colonial period material were recorded to the south and east of the proposed irrigation dam site (Sites ODS1074/002, ODS1074/003, ODS1074/005, and ODS1074/016). Fragments of hole-in-cap tins, square key-wind tins, and hand- and machine-soldered tins dating between the late-19th and early-20th century, as well as a Gargoyle MobilOil, can top dating between 1920-1940, were recorded. The material sample is small and without substantial archaeological context. The development impact on these resources is, therefore, inconsequential and these artefacts are deemed as not conservation worthy (NCW).

These sites are given a 'General' Protection C (Field Rating IV C). This means these sites have been sufficiently recorded (in Phase 1). It requires no further action.





Figure 8 Photographic selection of archaeological material recorded.

6.3.3 Graves

Close to the southern slope/wall of the existing quarry on the proposed irrigation dam footprint site, 27 visible graves of various sizes have been identified (ODS1074/001). The graves are demarcated with quartz and quartzite stones, and many of the graves have local fieldstone headstones. No inscriptions or markings were observed. The graves are orientated east-west and situated close together in an extent of approximately 60m x 10m, from north to south from the southern edge of the quarry. The dates and occupants of the graves are currently unknown.

The graves are situated some distance from the development footprint and should not be affected by the development. The graves are unfenced, however, and care should be taken to avoid the area altogether.

These sites are given a ‘Local Grade IIIB’ rating. This means the graves should be included in the heritage register and may be mitigated (high/ medium significance).



Figure 9 Selection of photographs of the graveyard.

6.3.4 Palaeontological resources

The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation (Areachap Group) of the Namaqua-Natal Province. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low while the Palaeontological Sensitivity of the Bethesda Formation is insignificant (Butler 2020). Elize Butler from Banzai Environmental conducted a full paleontological desktop study for this project (see Appendix 1).

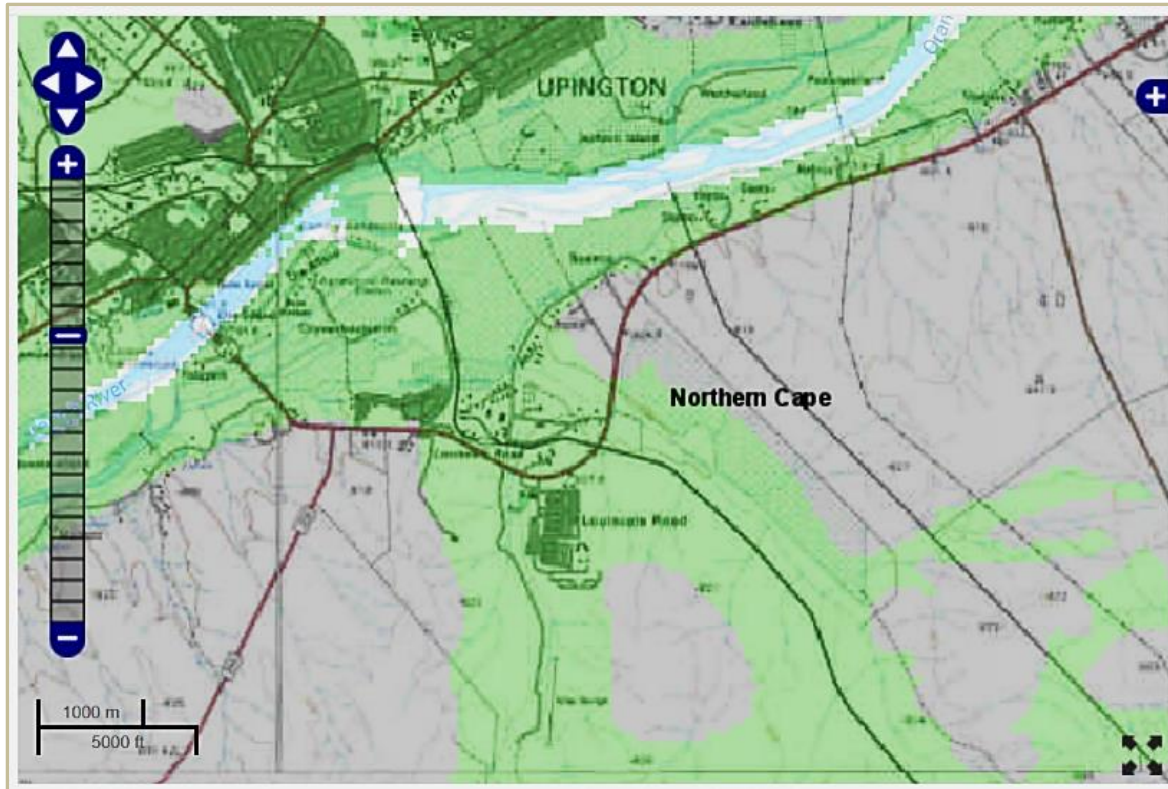


Figure 10 SAHRIS PalaeoSensitivity Map indicating zero (grey) and moderate (green) palaeontological significance in the study area (<https://sahris.sahra.org.za/map/palaeo>).

7. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

Description	Development Impact		Mitigation	Field rating/ Significance
Archaeological				
1. No archaeological sites or material were identified on the surveyed sections of Olyvenhouts Drift Settlement Erf 754.	Nature	N/A	No mitigation required.	N/A
	Extent	N/A		
	Duration	N/A		
	Intensity	N/A		
	Potential of impact on irreplaceable resource	N/A		
	Consequence	N/A		
	Probability of impact	N/A		
	Significance	N/A		
2. A total of 17 occurrences of MSA lithic material was recorded outside the development footprint on Olyvenhouts Drift Erf 1074. The recorded lithic material consists of low- to medium-density background scatters made predominantly from BIF, CCS and dolomite.	Nature	Neutral	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	Low		
	Intensity	Low		
	Potential of impact on irreplaceable resource	Low		
	Consequence	Low		
	Probability of impact	Low		
	Significance	Low		
3. A total of 4 incidences of historical material without archaeological context was	Nature	Neutral	No mitigation required.	Field Rating IV C Low significance
	Extent	Low		
	Duration	Low		

Description		Development Impact		Mitigation	Field rating/ Significance
recorded outside the development footprint on Olyvenhouts Drift Erf 1074.		Intensity	Low		
		Potential of impact on irreplaceable resource	Low		
		Consequence	Low		
		Probability of impact	Low		
		Significance	Low		
Graves					
4. An informal graveyard with a minimum of 27 graves was recorded near the southern edge of the proposed irrigation dam development footprint on Olyvenhouts Drift Erf 1074.		Nature	Neutral	Sites should be included in the heritage register and may be mitigated	Field Rating of Local Grade IIIB (high significance)
		Extent	Medium		
		Duration	High		
		Intensity	Low		
		Potential of impact on irreplaceable resource	Low		
		Consequence	High		
		Probability of impact	Low		
		Significance	Low		
Paleontological					
5. The Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low while the Palaeontological Sensitivity of the Bethesda Formation is insignificant.		Nature	N/A	No mitigation required.	N/A
		Extent	N/A		
		Duration	N/A		
		Intensity	N/A		
		Potential of impact on irreplaceable resource	N/A		
		Consequence	N/A		
		Probability of impact	N/A		
		Significance	N/A		

The impact of the development of the proposed vineyards on Development footprint 1 and 2 will have a negative impact on the identified heritage resources recorded on Olyvenhouts Drift Erf 1074. However, the cultural material is without any substantial archaeological context and deemed not conservation worthy. The negative impact is, therefore, negligible. The graves are of high significance, but the probability of impact on the graves are low, with the new proposed location of the irrigation dam. The probability of the development impacting on palaeontological heritage during the construction phase is regarded as minimal, and the significance of the impact occurring, low.

8. RECOMMENDATIONS

Based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

1. No significant heritage sites or features were identified within the surveyed sections of Olyvenhouts Drift Settlement Erf 754. No further mitigation is required for the proposed development on this property. Therefore, from a heritage point of view, we recommend that the proposed agricultural development can continue.

2. The Middle Stone Age (MSA) and historical period cultural material identified on Olyvenhouts Drift Settlement Drift Erf 1074 is not conservation worthy, and no further mitigation is recommended with regards to these resources.
3. The graveyard site (ODS1074/001) is situated between development footprint 1 and 2 on Olyvenhouts Drift Settlement Drift Erf 1074 and should not be impacted by the development. The site is graded as IIIB and is of High Local Significance. It is therefore still recommended that the graves be fenced off with the inclusion of a 50m buffer/safety zone.
4. Due to the zero to low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area as the igneous rocks underlying the site are not fossiliferous. It is therefore recommended that the project be exempt from a full Paleontological Impact Assessment (Butler 2020).
5. Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

9. CONCLUSION

This HIA has identified no heritage resources that will be impacted negatively by the proposed development footprints as defined in this report. The proposed construction of the irrigation dam and the agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Dawid Kruiper Local Municipality, ZF Mgcau District Municipality, Northern Cape can continue, provided the recommendation stipulated within this report, and the subsequent decision by SAHRA is followed.

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APPENDIX A

PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED DEVELOPMENT OF A PIPELINE, IRRIGATION DAM AND AGRICULTURAL EXPANSION ON ERVEN 1074 AND 754, OLYVENHOUTS DRIFT SETTLEMENT, UPINGTON, DAWID KRUIPER MUNICIPALITY, Z.F. MGCAWU DISTRICT MUNICIPALITY, NORTHERN CAPE

**PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED DEVELOPMENT
OF A PIPELINE, IRRIGATION DAM AND AGRICULTURAL EXPANSION ON
ERVEN 453, 281, 1074 AND 754, OLYVENHOUTS DRIFT SETTLEMENT, UPINGTON,
NORTHERN CAPE**

Compiled for:

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8814

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25 February 2019

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

PALAEONTOLOGICAL CONSULTANT:

CONTACT PERSON:

Banzai Environmental (Pty) Ltd

Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE:

A handwritten signature in black ink, appearing to read 'Elize Butler', with a stylized flourish at the end.

The Palaeontological Impact Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1: NEMA requirements

NEMA Regs (2014) - Appendix 6	Relevant section in report
1. (1) A specialist report prepared in terms of these Regulations must contain- details of- the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page ii and iii of Report – Contact details and company and Appendix A
a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
an indication of the scope of, and the purpose for which, the report was prepared;	Section 4 – Objective
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5 – Geological and Palaeontological history
(B) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9
the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
a description of the methodology adopted in preparing the report or carrying out the specialized process inclusive of equipment and modelling used;	Section 7
details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	N/A
an identification of any areas to be avoided, including buffers;	N/A
a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history
a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Section 10
any mitigation measures for inclusion in the EMPr;	N/A
any conditions for inclusion in the environmental authorization;	N/A
any monitoring requirements for inclusion in the EMPr or environmental authorization;	N/A
a reasoned opinion- as to whether the proposed activity, activities or portions thereof should be authorized; (iA) regarding the acceptability of the proposed activity or activities; and	Section 7

NEMA Regs (2014) - Appendix 6	Relevant section in report
if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan;	
a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable.
a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable.
any other information requested by the competent authority.	Not applicable.
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines

EXECUTIVE SUMMARY

UBIQUE Heritage Consultants appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Desktop Assessment assessing the palaeontological impact of the proposed development of an irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape. According to the National Heritage Resources Act (Act No 25 of 1999, Section 38), a Palaeontological Impact Assessment is required to identify the occurrence of fossils within the proposed development footprint and to calculate the impact of the development on the palaeontological resources.

The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation (Areachap Group) of the Namaqua-Natal Province. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low while the Palaeontological Sensitivity of the Bethesda Formation is insignificant (Almond and Pether 2008, SAHRIS website).

It is therefore considered that the extension of the proposed development of the irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the facility may be authorised as the whole extent of the development footprint is not considered sensitive in terms of palaeontological resources.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the ECO/site manager in charge of these developments must be informed immediately. These discoveries ought to be secured (preferably *in situ*) and the ECO/site manager ought to alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken by a professional palaeontologist.

The specialist would need a collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university), and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

TABLE OF CONTENT

1	INTRODUCTION	1
2	PROJECT DESCRIPTION	1
3	QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	5
4	LEGISLATION.....	5
4.1	National Heritage Resources Act (25 of 1999)	5
5	GEOLOGICAL AND PALAEONTOLOGICAL HISTORY	6
6	GEOGRAPHICAL LOCATION OF THE SITE	10
7	METHODS	11
7.1	Assumptions and Limitations	11
8	ADDITIONAL INFORMATION CONSULTED.....	11
9	IMPACT ASSESSMENT METHODOLOGY AND HIERARCHY	11
10	FINDINGS AND RECOMMENDATIONS	15
11	REFERENCES	16

LIST OF FIGURES

<i>Figure 1: The proposed development.</i>	<i>2</i>
<i>Figure 2: Topographical map of the proposed development.....</i>	<i>3</i>
<i>Figure 3: Google Earth Image of the proposed development.</i>	<i>4</i>
<i>Figure 4: Extract of the 1:250 000- 2820 Upington Geological Map (Council for Geoscience, Pretoria) indicating the approximate position of the proposed pipeline, irrigation dam and agricultural expansion on Erven 435, 281, 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape. The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation of the Namaqua-Natal Province.</i>	<i>7</i>
<i>Figure 5: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Approximate location of the proposed development is indicated in red.</i>	<i>10</i>

LIST OF TABLES

<i>Table 1: NEMA requirements</i>	<i>iv</i>
<i>Table 2: Table modified from Palaeotechnical Report (Almond and Pether 2009).</i>	<i>9</i>
<i>Table 3: The rating system</i>	<i>12</i>

Appendix A: CV

TERMINOLOGY AND ABBREVIATIONS

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 a change to the nature, appearance or physical nature of a place or influences its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- 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).

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.

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer

Abbreviations	Description
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

1. INTRODUCTION

EnviroAfrica cc has been appointed by the Turksvy Foto's Kunste en Rame CC., to conduct the NEMA Application for Environmental Authorisation process for the proposed development of a pipeline, irrigation dam and agricultural expansion on Erven 435, 281, 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape (Figure 1-3).

The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation of the Namaqua-Natal Province. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low while the Palaeontological Sensitivity of the Bethesda Formation is insignificant (Almond and Pether 2008, SAHRIS website).

2. PROJECT DESCRIPTION

The proposed development will include the following:

- Pumping water from the canal on Erf 281 to an old quarry. This will be transformed into an irrigation dam (reservoir), on Erf 1074 and will be used for irrigational purposes.
- Water from the proposed pipeline from Erf 281 will traverse beneath the N10 road and will be pumped into the proposed dam.

The establishment of new vineyards is planned on the south-eastern part of Erf 745.

No new roads will be constructed as current access roads will be used to gain access to the site

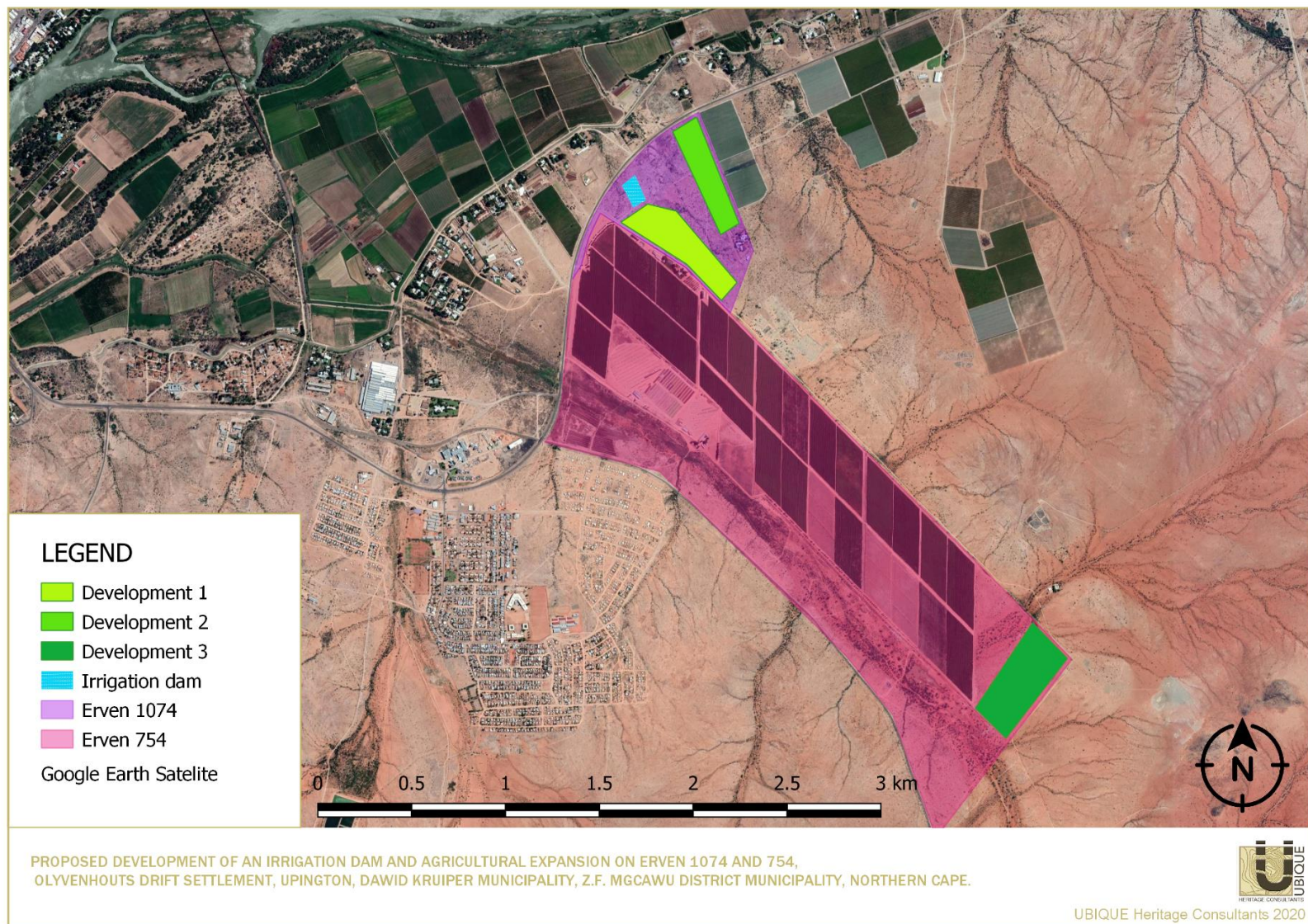


Figure 1: The proposed development.

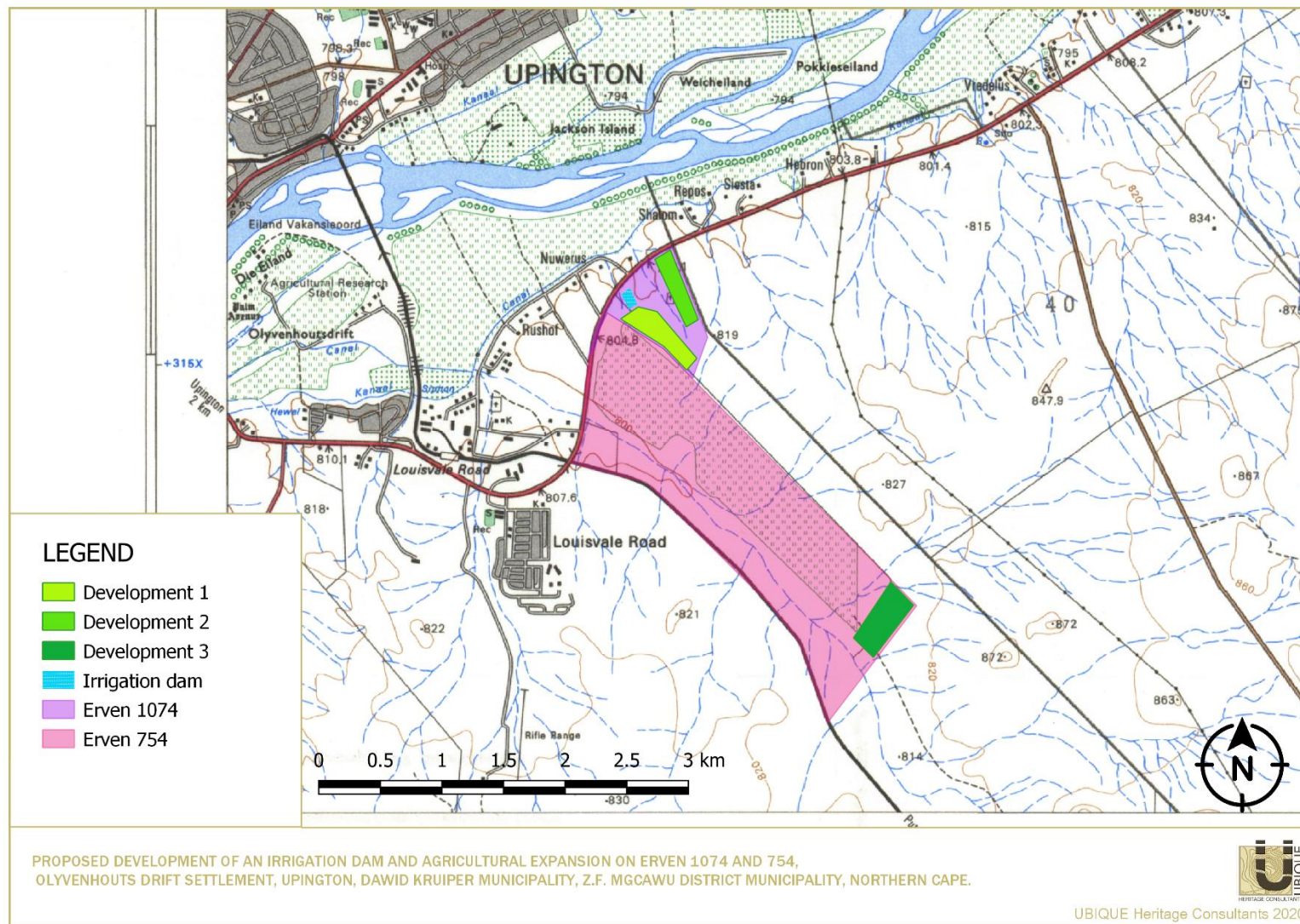


Figure 2: Topographical map of the proposed development.

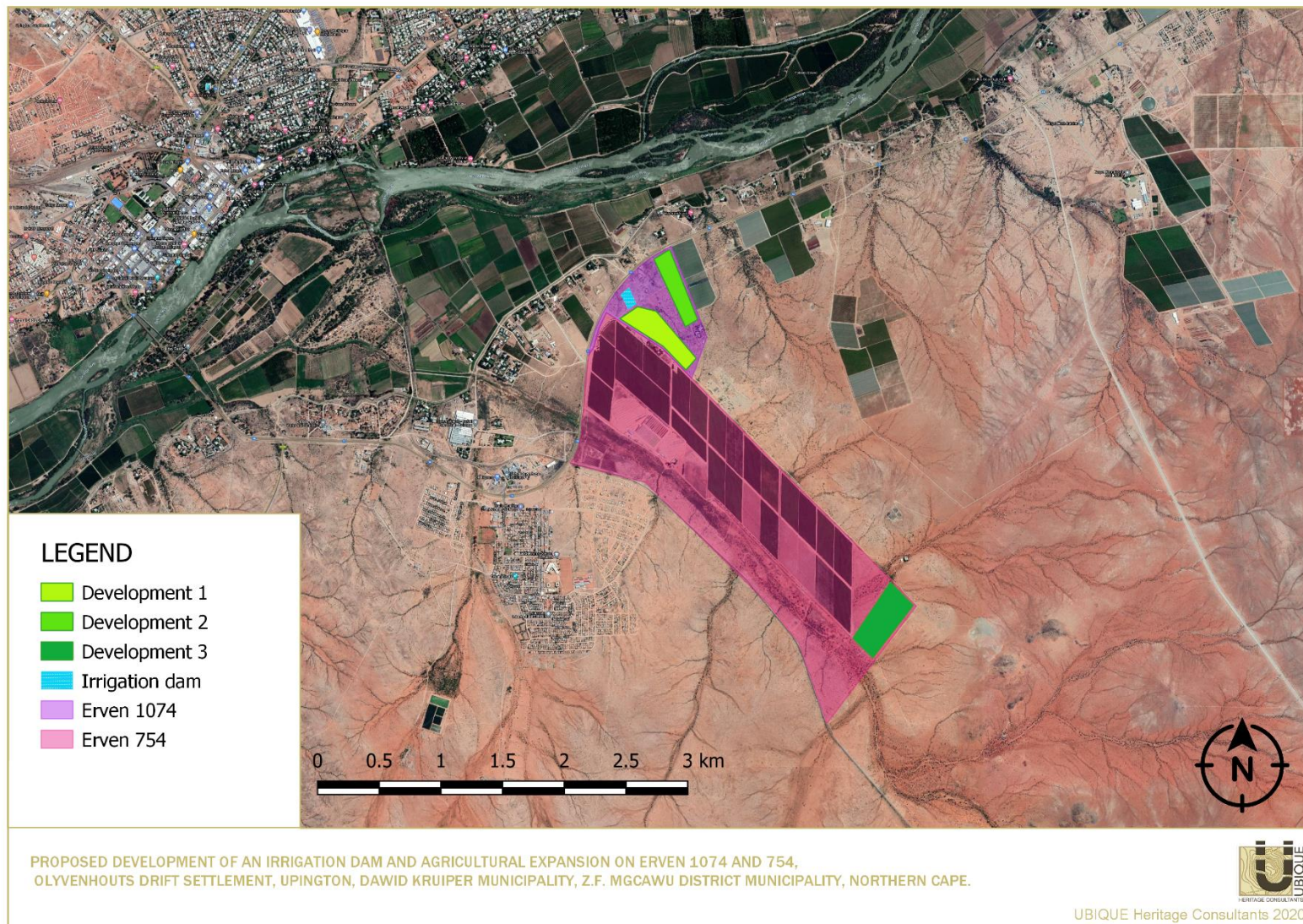


Figure 3: Google Earth Image of the proposed development.

3. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 12 years. She has been conducting PIAs since 2014.

4. LEGISLATION

4.1. National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Desktop Assessment forms part of the Heritage Impact Assessment (HIA) and adheres to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site—**
(exceeding 5 000 m² in extent; or
 - involving three or more existing erven or subdivisions thereof; or
 - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
 - the re-zoning of a site exceeding 10 000 m² in extent;

or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

5. GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation (Areachap Group) of the Namaqua-Natal Province (Figure 4). According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low while the Palaeontological Sensitivity of the Bethesda Formation is insignificant (Almond and Pether 2008, SAHRIS website).

The Cenozoic Kalahari Group is the most widespread body of terrestrial sediments in southern Africa. The Cenozoic sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180m (Partridge *et al.*, 2006). The youngest formation of the Kalahari group is the Gordonia Formation which is generally termed Kalahari sand and comprises of red aeolian sands that cover most of the Kalahari Group sediments. The pan sediments of the area originated from the Gordonia Formation and contain white to brown fine-grained silts, sands and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters. Quaternary alluvium, aeolian sands, surface limestone, silcrete, and terrace gravels are also included in the Kalahari Group (Kent 1980).

Partridge *et al.*, (2006) describes numerous types of superficial deposits of Late Caenozoic (Miocene to Pliocene to Recent) age throughout the Karoo Basin. Sands and gravel in the development footprint have a possible fluvial origin. The fossil assemblages of the Kalahari are generally very low in diversity and occur over a wide range, and thus the palaeontological diversity of this Group is low (SAHRIS website). These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which include termite and insect's burrows and mammalian trackways. Amphibian and crocodile remains have been uncovered where the depositional settings in the past were wetter (Table 2).

Almond and Pether 2008 allocated a low significance to the Kalahari Group because fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. In the past palaeontologists did not focus on Cenozoic superficial deposits although they sometimes comprise of significant fossil biotas. However, Groenewald and Groenewald (2014) allocated a high palaeontological sensitivity to the Cenozoic aged terrestrial organisms, which are important indicators of palaeo-environmental conditions.

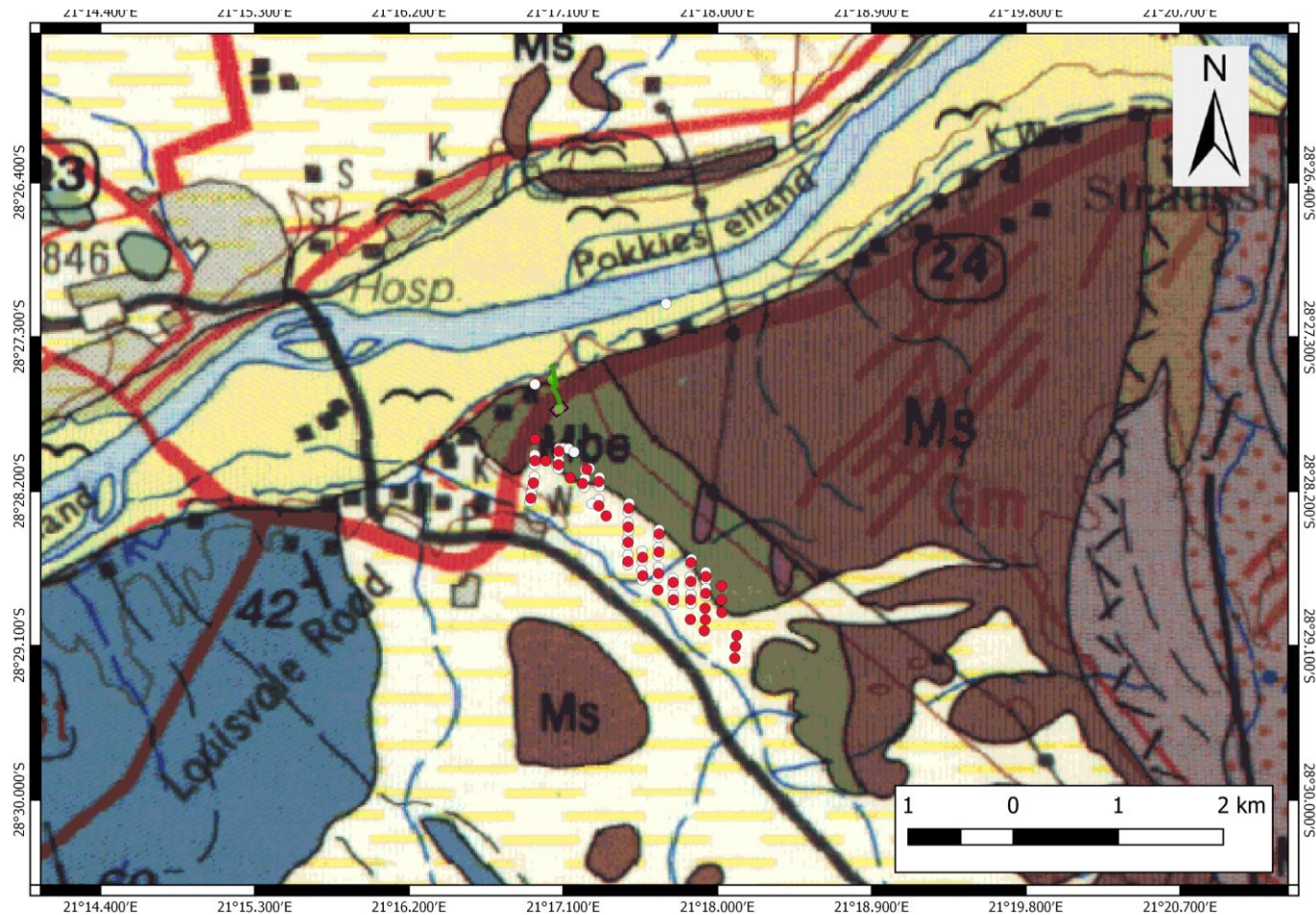
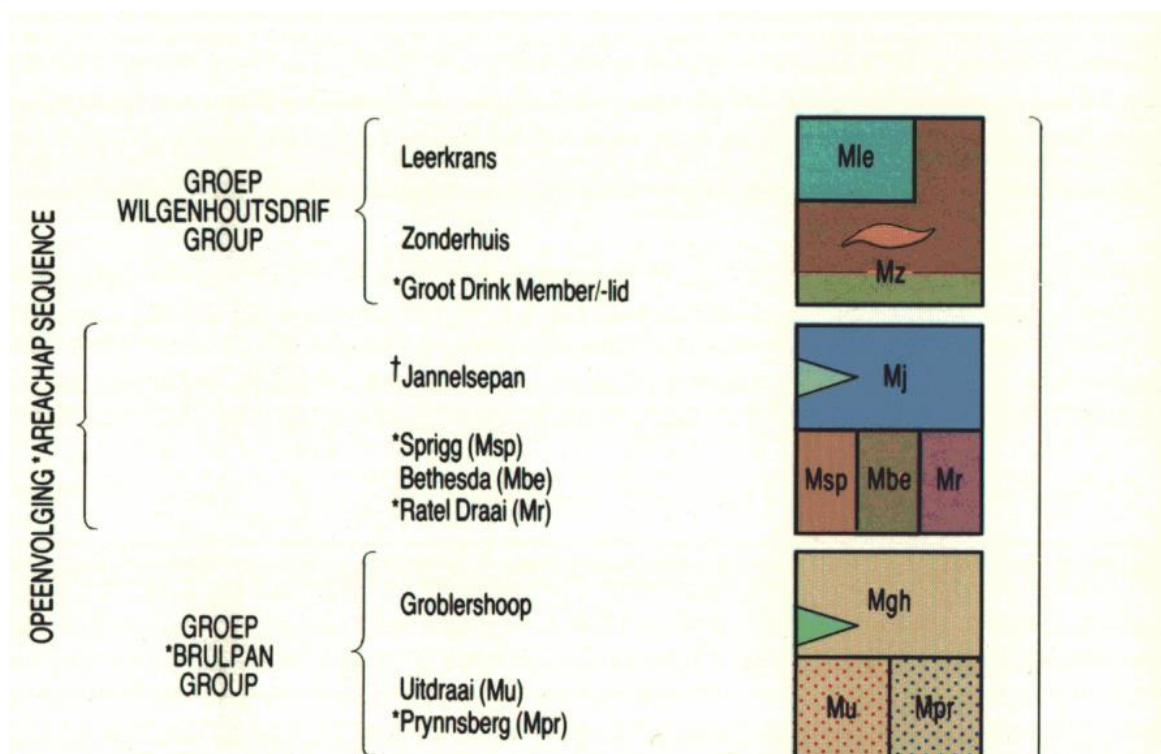
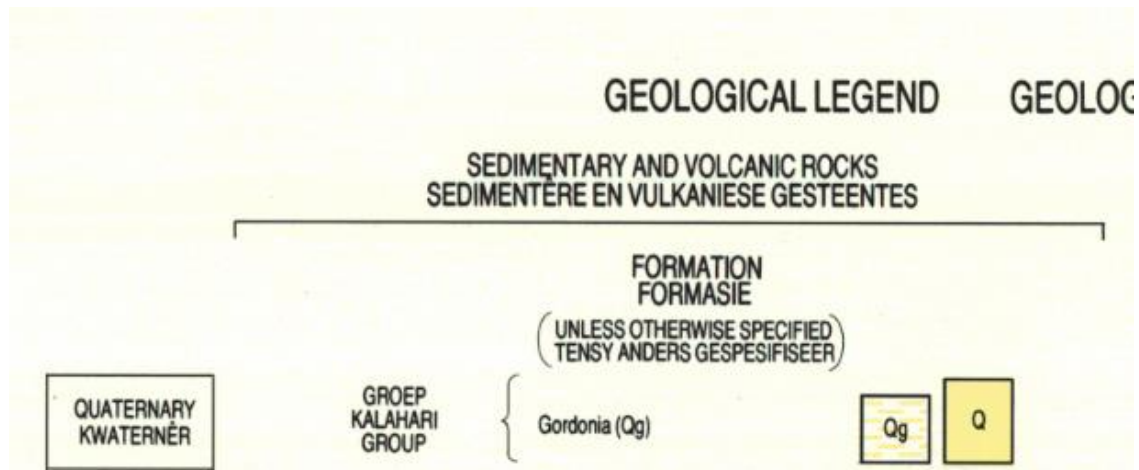


Figure 11: Extract of the 1:250 000- 2820 Upington Geological Map (Council for Geoscience, Pretoria) indicating the approximate position of the proposed pipeline, irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape. The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation of the Namaqua-Natal Province.



Legend to Map and short explanation.

Og – Kalahari Group. Quaternary, Red-brown windblown sand and dunes.

Mbe – Bethesda Formation; Areachap Group of the of the Namaqua-Natal Province. Migmatitic, biotite-rich and aluminous gneisses

Table 2: Table modified from Palaeotechnical Report (Almond and Pether 2009).

Subgroup/ sequence	Group	Formation	Fossil Heritage	Comment
Tertiary- Quaternary	Kalahari		Terrestrial organisms	Trace fossils, ostracods, bivalves, gastropod shells, diatoms, bones horn corns, mammalian teeth, Tortoiseshells

Namaqua-Natal Metamorphic Province (Bushmanland Group)

The development footprint is underlain by the Mid Proterozoic (Mokolian) basement rocks of the Namaqua-Natal Metamorphic Province (Bushmanland Group). The Namaqua-Natal Province is primarily highly metamorphosed sediments and volcanic rocks (e.g. gneisses, schists, quartzites, amphibolites) plus major granitic and gabbroic (norite) intrusions, are dated between 2050 and 1000 Ma (million years ago).

The Areachap Terrane is approximately 1300 Million years old and consists of amphibolite-grade metabasic and intermediate supracrustal gneisses of the Areachap Group. These gneisses are intruded by granitoid of the Keimoes Suite (Cornell et al., 2006).

The Areachap Group consists of several formations. The lowermost Sprigg Formation is present between Upington and Marydale and consists of schist and conglomerate. Geringer (1994) considered this Formation as the base of the Areachap Group, but its continental origin is conflicting with the allochthonous oceanic origin of other sections of the Group. The Bethesda Formation follows and has similar metapelite schists with migmatitic features without conglomerates. These sediments occur along the western margin where they are interlayered with amphibolites. The northern margin of the Areachap Group consists of the migmatitic amphibolite and calc-silicate of the Jannelsepan Formation. The Copperton Formation consists of homogeneous hornblende-biotite metadacite gneiss.

The Proterozoic granite-gneiss basement rocks of the Namaqua-Natal Metamorphic Province do not contain any fossils because they are igneous in origin or too highly metamorphosed (Almond & Pether 2008), and their palaeontological sensitivity is correspondingly low (Almond & Pether 2008, Almond 2008).

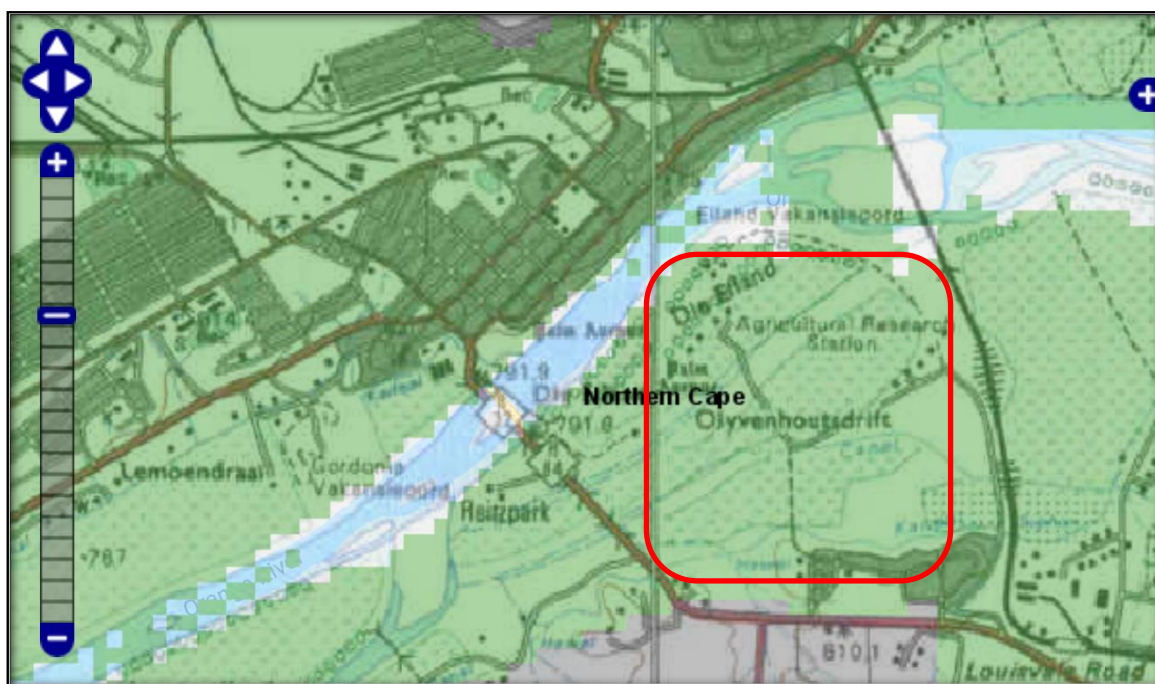


Figure 12: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Approximate location of the proposed development is indicated in red.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

According to the SAHRIS palaeosensitivity map (Figure 5), there is a moderate chance of finding fossils in this area.

6. GEOGRAPHICAL LOCATION OF THE SITE

The site coordinates are: 28°27'45.02"S, 21°17'2.87"E

The development is located to the South of Orange River on the M10

7. METHODS

A desktop study aims to evaluate the risk of palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes Palaeontological impact assessment reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

7.1. Assumptions and Limitations

When conducting a PIA, several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area, and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies are used, it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment is thus necessary to improve the accuracy of the desktop assessment

8. ADDITIONAL INFORMATION CONSULTED

In compiling this report, the following sources were consulted:

Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)

1: 250 000 2820 Upington Geological Map (Council of Geoscience)

A Google Earth map with polygons of the proposed development was obtained from Ubique Heritage.

9. IMPACT ASSESSMENT METHODOLOGY AND HIERARCHY

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria are used:

Table 3: The rating system

NATURE		
Include a brief description of the impact of the environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity. The Nature of the Impact is the possible destruction of fossil heritage		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 year), or the impact will last for the period of a relatively short construction period, and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).

2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partially reversible, but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.

4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.

51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

10. FINDINGS AND RECOMMENDATIONS

The Olyvenhouts Drift study area is underlain by the Gordonia Formation of the Kalahari Group and the Bethesda Formation of the Namaqua-Natal Province. According to the PalaeoMap of South African Heritage Resources Information System, the Palaeontological Sensitivity of the Gordonia Formation of the Kalahari Group is low but locally high while the Palaeontological Sensitivity of the Bethesda Formation is insignificant (Almond and Pether 2008, SAHRIS website).

It is therefore considered that the extension of the proposed development of an irrigation dam and agricultural expansion on Erven 1074 and 754, Olyvenhouts Drift Settlement, Upington, Northern Cape is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the facility may be authorised as the whole extent of the development footprint is not considered sensitive in terms of palaeontological resources.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the ECO/site manager in charge of these developments must be informed immediately. These discoveries ought to be secured (preferably *in situ*) and the ECO/site manager ought to alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken by a professional palaeontologist.

The specialist would need a collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university), and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

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APPENDIX A

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 26 years in Palaeontology

EDUCATION: B.Sc Botany and Zoology, 1988
University of the Orange Free State

B.Sc (Hons) Zoology, 1991
University of the Orange Free State

Management Course, 1991
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009
University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

Registered as a PhD fellow at the Zoology Department of the UFS

2013 to current

Dissertation title: A new gorgonopsian from the uppermost *Daptocephalus Assemblage Zone*, in the Karoo Basin of South Africa

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant Department of Zoology & Entomology
University of the Free State Zoology
1989-1992

Part time laboratory assistant Department of Virology
University of the Free State Zoology
1992

National Museum, Bloemfontein 1993 – 1997

National Museum, Bloemfontein
1998–currently

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2. Butler, E. 2014. Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoot, Northern Cape Province. 2014. Bloemfontein.
3. Butler, E. 2015. Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. Bloemfontein.
4. Butler, E. 2015. Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. Bloemfontein.
5. Butler, E. 2015. Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. Bloemfontein.
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9. Butler, E. 2015. Palaeontological Heritage Impact Assessment report on the establishment of the 65 mw Majuba Solar Photovoltaic facility and associated infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province. Bloemfontein.
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13. Butler, E. 2015. Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province. Bloemfontein.
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99. Butler, E. 2018. Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.
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129. E. Butler. 2019. Palaeontological Desktop Assessment of the proposed mining permit application for the removal of diamonds alluvial and diamonds kimberlite near Windsorton on a certain portion of Farm Zoelen's Laagte 158, Registration Division: Barkly Wes, Northern Cape Province.
130. E. Butler. 2019. Palaeontological Desktop Assessment of the proposed Vedanta Housing Development, Pella Mission 39, Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape.
131. E. Butler. 2019. Palaeontological Desktop Assessment for The Proposed 920 Kwp Groenheuwel Solar Plant Near Augrabies, Northern Cape Province
132. E. Butler. 2019. Palaeontological Desktop Assessment for the establishment of a Super Fines Storage Facility at Amandelbult Mine, Near Thabazimbi, Limpopo Province
133. E. Butler. 2019. Palaeontological Impact Assessment for the proposed Sace Lifex Project, Near Emalahleni, Mpumalanga Province
134. E. Butler. 2019. Palaeontological Desktop Assessment for the proposed Rehau Fort Jackson Warehouse Extension, East London
135. E. Butler. 2019. Palaeontological Desktop Assessment for the proposed Environmental Authorisation Amendment for moving 3 Km Of the Merensky-Kameni 132KV Powerline
136. E. Butler. 2019. Palaeontological Impact Assessment for the proposed Umsobomvu Solar PV Energy Facilities, Northern and Eastern Cape
137. E. Butler. 2019. Palaeontological Desktop Assessment for six proposed Black Mountain Mining Prospecting Right Applications, without Bulk Sampling, in the Northern Cape.
138. E. Butler. 2019. Palaeontological field Assessment of the Filling Station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng
139. E. Butler. 2019. Palaeontological Desktop Assessment Of The Proposed Upgrade Of The Vaal Gamagara Regional Water Supply Scheme: Phase 2 And Groundwater Abstraction
140. E. Butler. 2019. Palaeontological Desktop Assessment Of The Expansion Of The Jan Kempdorp Cemetry On Portion 43 Of Farm Guldenskat 36-Hn, Northern Cape Province
141. E. Butler. 2019. Palaeontological Desktop Assessment of the Proposed Residential Development On Portion 42 Of Farm Geldunskat No 36 In Jan Kempdorp, Phokwane Local Municipality, Northern Cape Province
142. E. Butler. 2019. Palaeontological Impact Assessment of the proposed new Township Development, Lethabo Park, on Remainder of Farm Roodepan No 70, Erf 17725 And Erf 15089, Roodepan Kimberley, Sol Plaatjies Local Municipality, Frances Baard District Municipality, Northern Cape
143. E. Butler. 2019. Palaeontological Protocol for Finds for the proposed 16m WH Battery Storage System in Steinkopf, Northern Cape Province
144. E. Butler. 2019. Palaeontological Exemption Letter of the proposed 4.5WH Battery Storage System near Midway-Pofadder, Northern Cape Province

145. E. Butler. 2019. Palaeontological Exemption Letter of the proposed 2.5ml Process Water Reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape
146. E. Butler. 2019. Palaeontological Desktop Assessment for the Establishment of a Super Fines Storage Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape:
147. E. Butler. 2019. Palaeontological Desktop Assessment for the Proposed New Railway Bridge, and Rail Line Between Hotazel And The Gloria Mine, Northern Cape Province
148. E. Butler. 2019. Palaeontological Exemption Letter Of The Proposed Mixed Use Commercial Development On Portion 17 Of Farm Boegoeberg Settlement Number 48, !Kheis Local Municipality In The Northern Cape Province
149. E. Butler. 2019. Palaeontological Desktop Assessment Of The Proposed Diamond Mining Permit Application Near Kimberley, Sol Plaatjies Municipality, Northern Cape Province
150. E. Butler. 2019. Palaeontological Desktop Assessment of the Proposed Diamonds (Alluvial, General & In Kimberlite) Prospecting Right Application near Postmasburg, Registration Division; Hay, Northern Cape Province
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153. E. Butler. 2019. Palaeontological Desktop Assessment of the proposed seepage interception drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga Province
154. E. Butler. 2019. Palaeontological Desktop Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng.
155. E. Butler. 2019. Palaeontological Phase 1 Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng.
156. E. Butler. 2019. Palaeontological field Assessment for the Proposed Upgrade of the Kolomela Mining Operations, Tsantsabane Local Municipality, Siyanda District Municipality, Northern Cape Province, Northern Cape
157. E. Butler. 2019. Palaeontological Desktop Assessment of the proposed feldspar prospecting rights and mining application on portion 4 and 5 of the farm Rozynen 104, Kakamas South, Kai! Garib Municipality, Zf Mgcawu District Municipality, Northern Cape
158. E. Butler. 2019. Palaeontological Phase 1 Field Assessment of the proposed Summerpride Residential Development and Associated Infrastructure on Erf 107, Buffalo City Municipality, East London.
159. E. Butler. 2019. Palaeontological Desktop Impact Assessment for the proposed re-commission of the Old Balgray Colliery near Dundee, Kwazulu Natal.
160. E. Butler. 2019. Palaeontological Phase 1 Impact Assessment for the Proposed Re-Commission of the Old Balgray Colliery near Dundee, Kwazulu Natal.
161. E. Butler. 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery.

162. E. Butler. 2019. Palaeontological Impact Assessment and Protocol for Finds of a Proposed New Quarry on Portion 9 (of 6) of the farm Mimosa Glen 885, Bloemfontein, Free State Province
163. E. Butler. 2019. Palaeontological Impact Assessment and Protocol for Finds of a proposed development on Portion 9 and 10 of the Farm Mimosa Glen 885, Bloemfontein, Free State Province
164. E. Butler. 2019. Palaeontological Exemption Letter for the proposed residential development on the Remainder of Portion 1 of the Farm Strathearn 2154 in the Magisterial District of Bloemfontein, Free State
165. E. Butler. 2019. Palaeontological Field Assessment for the Proposed Nigel Gas Transmission Pipeline Project in the Nigel Area of the Ekurhuleni Metropolitan Municipality, Gauteng Province
166. E. Butler. 2019. Palaeontological Desktop Assessment for five Proposed Black Mountain Mining Prospecting Right Applications, Without Bulk Sampling, in the Northern Cape.
167. E. Butler. 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and an Integrated Water Use Licence Application for the Reclamation of the Marievale Tailings Storage Facilities, Ekurhuleni Metropolitan Municipality - Gauteng Province.
168. E. Butler. 2019. Palaeontological Impact Assessment for the Proposed Sace Lifex Project, near Emalahleni, Mpumalanga Province.
169. E. Butler. 2019. Palaeontological Desktop Assessment for the proposed Golfview Colliery near Ermelo, Msukaligwa Local Municipality, Mpumalanga Province
170. E. Butler. 2019. Palaeontological Desktop Assessment for the Proposed Kangra Maquasa Block C Mining development near Piet Retief, in the Mkhondo Local Municipality within the Gert Sibande District Municipality
171. E. Butler. 2019. Palaeontological Desktop Assessment for the Proposed Amendment of the Kusipongo Underground and Opencast Coal Mine in Support of an Environmental Authorization and Waste Management License Application.
172. E. Butler. 2019. Palaeontological Exemption Letter of the Proposed Mamatwan Mine Section 24g Rectification Application, near Hotazel, Northern Cape Province