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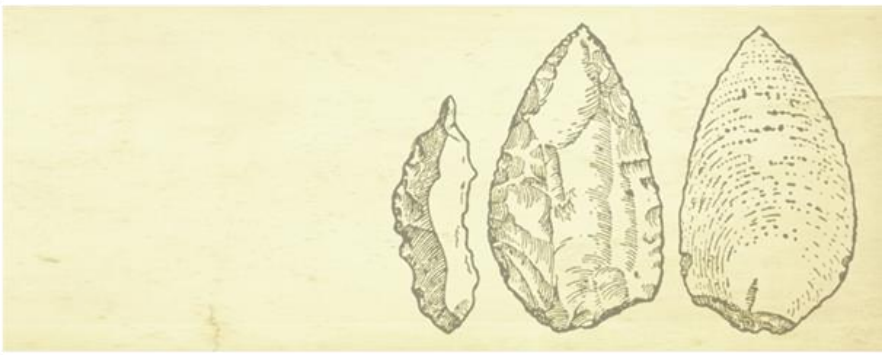


# PHASE 1 HIA REPORT ON THE REMAINDER OF THE FARM MIER NO. 585, LOUBOS, NORTHERN CAPE

## PROPOSED OXIDATION PONDS, LOCATED ON THE REMAINDER OF THE FARM MIER NO. 585, LOUBOS, DAWID KRUIPER LOCAL MUNICIPALITY, Z.F. MGCAWU DISTRICT MUNICIPALTY, NORTHERN CAPE.

**PREPARED FOR:**
ENVIROAFRICA CC

**PREPARED BY:**
JAN ENGELBRECHT & HEIDI FIVAZ
UBIQUE HERITAGE CONSULTANTS

06 DECEMBER 2018

**Web:** www.ubiquecrm.com **Mail**: info@ubiquecrm.com
**Office:** (+27)116750125 **Address:** P.O. Box 5022 Weltevredenpark 1715
CSD Supplier Number MAAA0586123

**Client:** EnviroAfrica CC.

P.O. Box 5367, Helderberg, 7135
Fax: 086 512 0154 / Tel: 021 8511616 /
E-mail: admin@enviroafrica.co.za

**Contact Person:** Bernard de Witt
E-mail: bernard@enviroafrica.co.za

**Heritage Consultant:** UBIQUE Heritage Consultants

**Contact Person:** Jan Engelbrecht (archaeologist and lead CRM specialist)
Member of the Association of Southern African Professional Archaeologists: Member number: 297
Cell: (+27) 0828456276
E-mail: jan@ubiquecrm.com

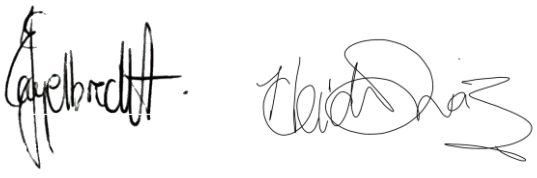
Heidi Fivaz (archaeologist)
Member of the Association of Southern African Professional Archaeologists: Member number: 433
Cell: (+27) 0721418860
E-mail: heidi@ubiquecrm.com

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.



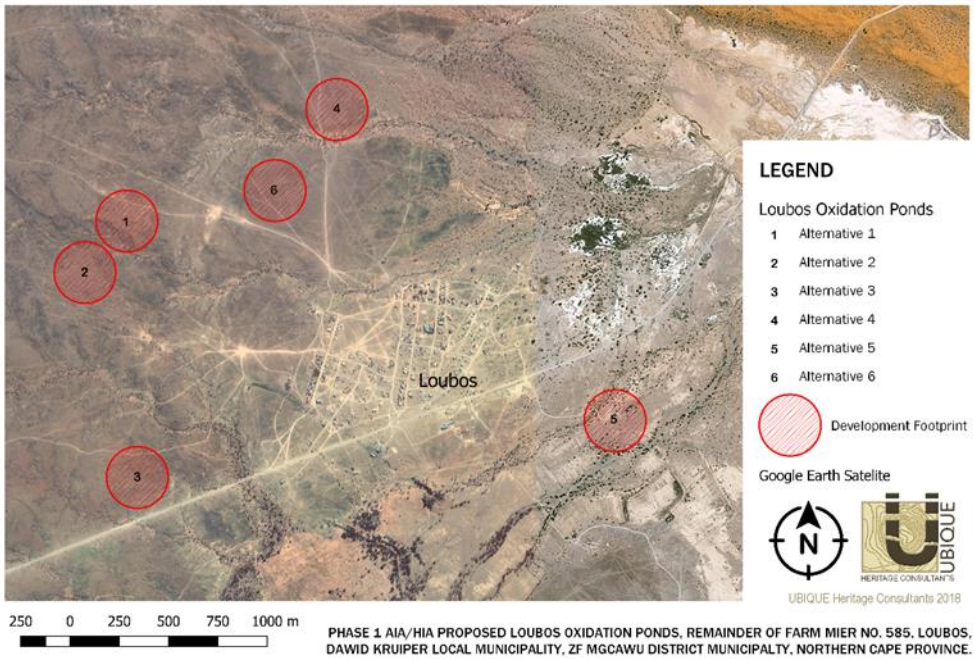
**Signed:** **Date: 2018-12-06**

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

# EXECUTIVE SUMMARY

## Technical summary

| Project description | |
|---|---|
| Project name | PROPOSED LOUBOS OXIDATION PONDS, REMAINDER OF FARM MIER NO. 585, LOUBOS, DAWID KRUIPER LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALTY, NORTHERN CAPE PROVINCE. |
| Description | Proposed oxidation ponds for the town of Loubos, to be constructed on the Remainder of the Farm Mier no. 585, Northern Cape. |
| **Developer** | |
| Dawid Kruiper Local Municipality | |
| **Consultants** | |
| Environmental | EnviroAfrica cc. |
| Heritage and archaeological | UBIQUE Heritage Consultants |
| Paleontological | Banzai Environmental |
| **Property details** | |
| Province | Northern Cape |
| District municipality | Z.F. Mgcawu District Municipality |
| Local municipality | Dawid Kruiper Local Municipality |
| Topo-cadastral map | 2620CA RIETFONTEIN |
| Farm name | Remainder of Farm Mier No. 585 |
| Closest town | Loubos |
| GPS Co-ordinates | Site Alternative 1: 26°42' 12.58"S; 20°05' 57.85"E<br>Site Alternative 2: 26°42' 20.85"S; 20°05' 49.03"E<br>Site Alternative 3: 26°42' 55.05"S; 20°05' 59.76"E<br>Site Alternative 4: 26°41' 53.82"S; 20°06' 37.09"E<br>Site Alternative 5: 26°42' 45.17"S; 20°07' 27.29"E<br>Site Alternative 6: 26°42' 07.53"S; 20°06' 24.80"E |




| Development footprint size | 0.24 ha |
|---|---|

## Project description

UBIQUE Heritage Consultants were appointed by EnviroAfrica cc. as independent heritage specialists in accordance with Section 38 of the NHRA, to conduct a cultural heritage assessment to determine the impact of the proposed development of oxidation ponds for the town of Loubos, situated on Remainder of the Farm Mier No. 585, on any sites, features, or objects of cultural heritage significance. Six possible alternatives for the development have been identified to the north, west, southwest, and southeast of the town of Loubos, within the Dawid Kruiper Local Municipality, Z.F. Mgcawu District Municipality, Northern Cape Province.

## Findings and Impact on Heritage Resources

### Alternatives 1 and 2

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| **Stone Age** | | | |
| 1. MSA core, punch, scraper, flakes and chunks. Lithic debris. Out of context. In area of approximately 10- 20 m². | MSA/Early LSA | **26º 42' 15.14" S 20º 05' 44.62" E** | Field Rating IV C Low significance |
| 2. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 15.14" S 20º 05' 44.62" E** | Field Rating IV C Low significance |
| 3. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 19.36" S 20º 05' 42.56" E** | Field Rating IV C Low significance |
| 4. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 15.17" S 20º 05' 47.29" E** | Field Rating IV C Low significance |
| 5. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 20.55" S 20º 05' 50.84" E** | Field Rating IV C Low significance |
| 6. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 27.79" S 20º 05' 50.10" E** | Field Rating IV C Low significance |
| 7. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | **26º 42' 27.13" S 20º 05' 47.24" E** | Field Rating IV C Low significance |
| 8. LSA upper grinder, no context. | LSA | **26º 42' 25.83" S 20º 05' 48.00" E** | Field Rating IV C Low significance |
| 9. MSA small knapping site over an area of approximately 20 m² . Lithic debris, flakes, chunks, chips, cores. Concentration of lithics- medium density and frequency. | MSA/Early LSA | **26º 42' 24.01" S 20º 05' 48.56" E** | Field Rating IV B Medium significance |
| 10. MSA Debitage (chips and flakes). No context. | MSA/Early LSA | **26º 42' 13.03" S 20º 05' 48.93" E** | Field Rating IV C Low significance |
| **Historical** | | | |
| 11. No historical features were identified. | | | N/A |

| Graves | | | |
|---|---|---|---|
| 12. No formal or informal graves were identified. | | | N/A |

## Alternative 3

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 1. MSA punch, no context. | MSA/Early LSA | 26º 42' 55.55" S 20º 06' 02.30" E | Field Rating IV C Low significance |
| 2. MSA scrapers, no context. | MSA/Early LSA | 26º 42' 54.42" S 20º 06' 02.37" E | Field Rating IV C Low significance |
| 3. LSA upper grinder and LSA/MSA chunk, no context. | MSA/LSA | 26º 42' 54.68" S 20º 06' 00.52" E | Field Rating IV C Low significance |
| 4. MSA Debitage (chips, chunks) | MSA/Early LSA | 26º 42' 57.93" S 20º 05' 59.38" E | Field Rating IV C Low significance |
| 5. LSA/MSA Upper grinder/ punch, no context. | MSA/LSA | 26º 43' 00.49" S 20º 06' 01.38" E | Field Rating IV C Low significance |
| 6. MSA scraper or chip, no context. | MSA/Early LSA | 26º 43' 00.18" S 20º 06' 01.74" E | Field Rating IV C Low significance |
| Historical | | | |
| 7. No historical features were identified. | | | N/A |
| Graves | | | |
| 8. No formal or informal graves were identified. | | | N/A |

## Alternative 4

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 1. Possible MSA broken punch or upper grinder, no context. | MSA/Early LSA | 26º 41' 49.37 S 20º 06' 30.06" E | Field Rating IV C Low significance |
| 2. MSA chips, chunks or flakes, no context. | MSA/Early LSA | 26º 41' 48.35 S 20º 06' 28.74" E | Field Rating IV C Low significance |
| 3. MSA chunks and flakes, debris, no context. | MSA/Early LSA | 26º 41' 55.07 S 20º 06' 42.82" E | Field Rating IV C Low significance |
| 4. MSA chips and flakes, debris, no context. | MSA/Early LSA | 26º 41' 55.77 S 20º 06' 41.35" E | Field Rating IV C Low significance |
| 5. Possible MSA cores, no context. | MSA/Early LSA | 26º 41' 56.57 S 20º 06' 40.32" E | Field Rating IV C |

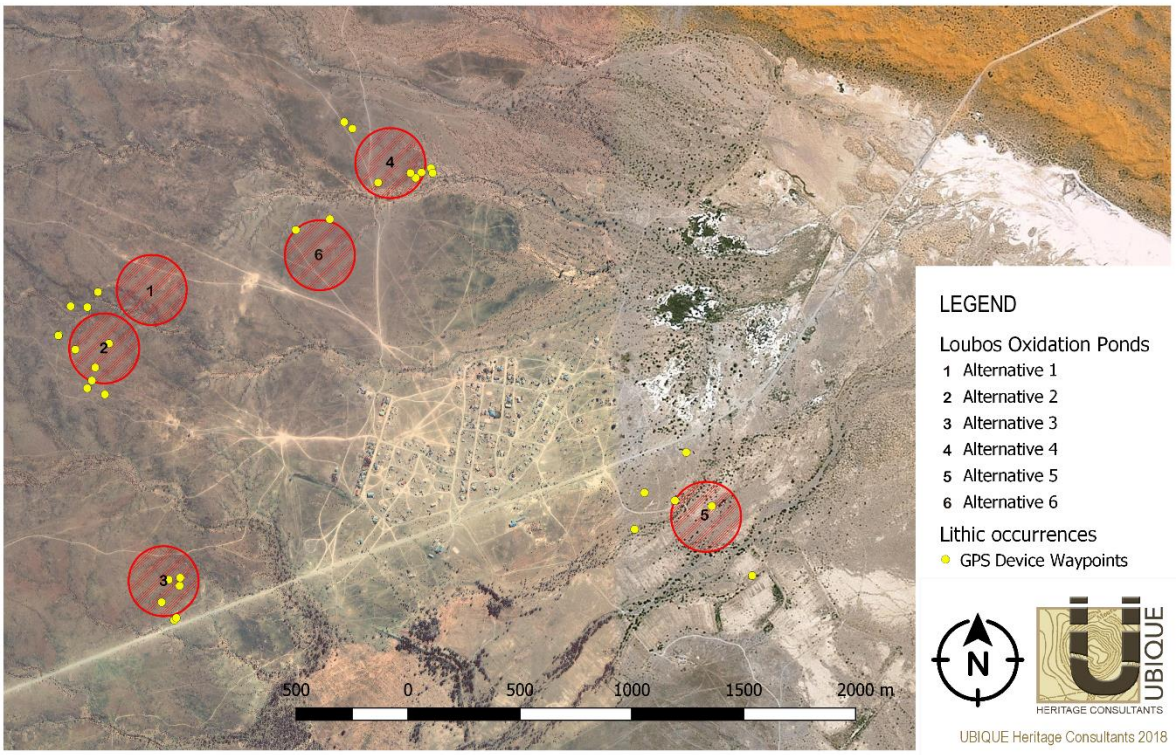
| | | | |
|---|---|---|---|
| | | | Low significance |
| 6. Possible MSA core and flake, possible micro knapping site material. | MSA/Early LSA | 26º 41' 55.84 S<br>20º 06' 39.50" E | Field Rating IV C<br>Low significance |
| 7. MSA core and flakes, possible micro knapping site. | MSA/Early LSA | 26º 41' 57.26 S<br>20º 06' 34.35" E | Field Rating IV C<br>Low significance |
| 8. MSA chunks and flakes, random debris, no context. | MSA/Early LSA | 26º 41' 55.90 S<br>20º 06' 43.10" E | Field Rating IV C<br>Low significance |
| Historical | | | |
| 9. No historical features were identified. | | | N/A |
| Graves | | | |
| 10. No formal or informal graves were identified. | | | N/A |

## Alternative 5

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 1. MSA scraper and core, no context. | MSA/Early LSA | 26º 42' 42.93" S<br>20º 07' 22.11" E | Field Rating IV C<br>Low significance |
| 2. MSA chunks and flakes, random debris, no context. | MSA/Early LSA | 26º 42' 47.18" S<br>20º 07' 15.61" E | Field Rating IV C<br>Low significance |
| 3. MSA chunks, chips and core. Random debris, possible micro knapping area. | MSA/Early LSA | 26º 42' 41.89" S<br>20º 07' 17.31" E | Field Rating IV C<br>Low significance |
| 4. MSA chunks, chips and core. Random debris, possible micro knapping area. | MSA/Early LSA | 26º 42' 41.89" S<br>20º 07' 17.31" E | Field Rating IV C<br>Low significance |
| 5. MSA chips and flakes, random debris, no context. | MSA/Early LSA | 26º 42' 36.29" S<br>20º 07' 23.99" E | Field Rating IV C<br>Low significance |
| 6. MSA flakes, small core and hollow scraper. No context. | MSA/Early LSA | 26º 42' 43.78" S<br>20º 07' 28.01" E | Field Rating IV C<br>Low significance |
| 7. MSA flakes and chip, random debris, no context. | MSA/Early LSA | 26º 42' 54.10" S<br>20º 07' 34.89" E | Field Rating IV C<br>Low significance |
| Historical | | | |
| 1. Dam wall/retainer wall for previous cultivation. 1920-30s- 1980s | | 26º 42' 50.09" S<br>20º 07' 36.03" E | Field Rating IVC<br>Low significance |
| 2. Dam wall/retainer wall for previous cultivation. | | 26º 42' 53.71" S<br>20º 07' 36.15" E | Field Rating IVC<br>Low significance |
| Graves | | | |
| 3. No formal or informal graves were identified. | | | N/A |

## Alternative 6

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| **Stone Age** | | | |
| 1. MSA flakes, random debris, no context. Low density and frequency 9 flakes per 20 m². | MSA/Early LSA | **26º 42' 02.58" S 20º 06' 26.51" E** | Field Rating IV C Low significance |
| 2. MSA small knapping site. Scatters of MSA debris over an area of approximate 50 m². Cores, flakes, scrapers, chunks and other. | MSA/Early LSA | **26º 42' 04.12" S 20º 06' 20.97" E** | Field Rating IV B Medium significance |
| **Historical** | | | |
| 3. No historical features were identified. | | | N/A |
| **Graves** | | | |
| 4. No formal or informal graves were identified. | | | N/A |




PHASE 1 HIA PROPOSED OXIDATION PONDS, LOCATED ON THE REMAINDER OF THE FARM MIER NO. 585, LOUBOS, DAWID KRUIPER LOCAL MUNICIPALITY, Z.F. MGCAWU DISTRICT MUNICIPALTY, NORTHERN CAPE.

***Figure 1*** *Lithic occurrences across the study area, indicated on Google Satellite Image.*

## 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. The lithic traces on the landscape of proposed Alternatives 1, 3, 4, and 5 are of Low Significance and the impact of the development on these resources are inconsequential. Alternative 5 lies within a flood plain, and although the impact on heritage resources is negligible, might not be a feasible option. No further mitigation is required regarding heritage resources. Therefore, from a heritage point of view we recommend that the proposed development can continue any of these proposed Alternatives.

2. Alternatives 2 and 6 have lithics scatters that are deemed as Medium Significance and should be mitigated before development can commence on these proposed Alternatives. Mitigation would require sampling, mapping and recording of sensitive areas. Furthermore, care should be taken to avoid these areas completely until its significance can be fully accessed by a professional, especially during construction at any of the more feasible Alternatives.

3. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. 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. If fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably in situ) and the ECO must report to SAHRA so that appropriate mitigation (e.g. recording, collection) can be carried out by a professional palaeontologist (Butler 2018).

4. 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 possible discovery of finds such as stone tool scatters, artefacts, human remains, or fossils are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

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# 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: 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;

- 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.

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.<br>Early Iron Age: AD 200 - AD 900<br>Middle Iron Age: AD 900 - AD 1300<br>Later Iron Age: AD 1300 - AD 1850 |
| Historic: | Period of arrival of white settlers and colonial contact.<br>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 (historical 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;<br>– a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;<br>– 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;<br>– an open space, including a public square, street or park; and<br>– 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 oxidation ponds for the town of Loubos, situated on Remainder of the Farm Mier no. 585. 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 aim of the assessment is 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 jeopardized 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 in 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 important 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 make an assessment as to 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 development**:

- 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);
- Eco facts (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 administrated by a local authority. Graves in the category located inside a formal cemetery administrated 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 of 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 literature was undertaken to obtain background information regarding the area. 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 have been performed within the wider vicinity of the study area. Sources consulted in this regard are indicated in the bibliography.

## 3.2 Field study

The 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 8th, 9th, and 12th of October 2018 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 attempt to look beneath the surface beyond the inspection of rodent burrows, cut banks and other exposures fortuitously observed.

### 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 Sony Coolpix 10-megapixel camera. Detailed fieldnotes were taken to describe observations. The layout of the area and plotted by 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.

### 3.3 Oral history

Where possible, people from local communities will be 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. on behalf of Dawid Kruiper Local Municipality, 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 oxidation ponds for the town of Loubos, situated on Remainder of the Farm Mier No. 585, on any sites, features, or objects of cultural heritage significance. Six possible alternatives for the development have been

identified to the north, west, southwest, and southeast of the town of Loubos, within the Dawid Kruiper Local Municipality, Z.F. Mgcawu District Municipality, Northern Cape Province.

The proposed project entails the construction of new oxidation ponds near the town. The oxidation ponds will consist of the following: 2 x Anaerobic Ponds (525 $m^3$), 1 x Facultative Pond (1013 $m^3$), 2 x Aerobic Ponds (2025 $m^3$) and 1 x Final Storage Pond (700 $m^3$). The total surface area of the oxidation ponds will be 0.24ha. Sewerage will be collected from the existing conservancy tanks in Loubos and be transported and disposed of in the proposed oxidation ponds for treatment.

## 4.1 Technical information

| Project description | |
|---|---|
| Project name | PROPOSED LOUBOS OXIDATION PONDS, REMAINDER OF FARM MIER NO. 585, LOUBOS, DAWID KRUIPER LOCAL MUNICIPALITY, ZF MGCAWU DISTRICT MUNICIPALTY, NORTHERN CAPE PROVINCE. |
| Description | Proposed oxidation ponds for the town of Loubos, to be built on the Remainder of the Farm Mier No. 585, Northern Cape. |
| **Developer** | |
| Dawid Kruiper Local Municipality | |
| Contact information | Tel: 054-3387000 |
| Development type | Municipal infrastructure |
| **Land owner** | |
| | |
| Contact information | Tel: 054-5110078 |
| **Consultants** | |
| Environmental | EnviroAfrica cc |
| Heritage and archaeological | UBIQUE Heritage Consultants |
| Paleontological | Banzai Environmental |
| **Property details** | |
| Province | Northern Cape |
| District municipality | Z.F. Mgcawu District Municipality |
| Local municipality | Dawid Kruiper Local Municipality |
| Topo-cadastral map | 2620CA |
| Farm name | Remainder of the Farm Mier No. 585 |
| Closest town | Loubos |
| GPS Co-ordinates | Site Alternative 1: 26°42' 12.58"S; 20°05' 57.85"E<br>Site Alternative 2: 26°42' 20.85"S; 20°05' 49.03"E<br>Site Alternative 3: 26°42' 55.05"S; 20°05' 59.76"E<br>Site Alternative 4: 26°41' 53.82"S; 20°06' 37.09"E<br>Site Alternative 5: 26°42' 45.17"S; 20°07' 27.29"E<br>Site Alternative 6: 26°42' 07.53"S; 20°06' 24.80"E |
| Property size | 0.24 ha |
| Development footprint size | 0.24 ha |
| **Land use** | |
| Previous | N/A |

| | |
|---|---|
| Current | N/A |
| Re- zoning required | Yes |
| 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. | No |
| 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. | No |
| 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 |

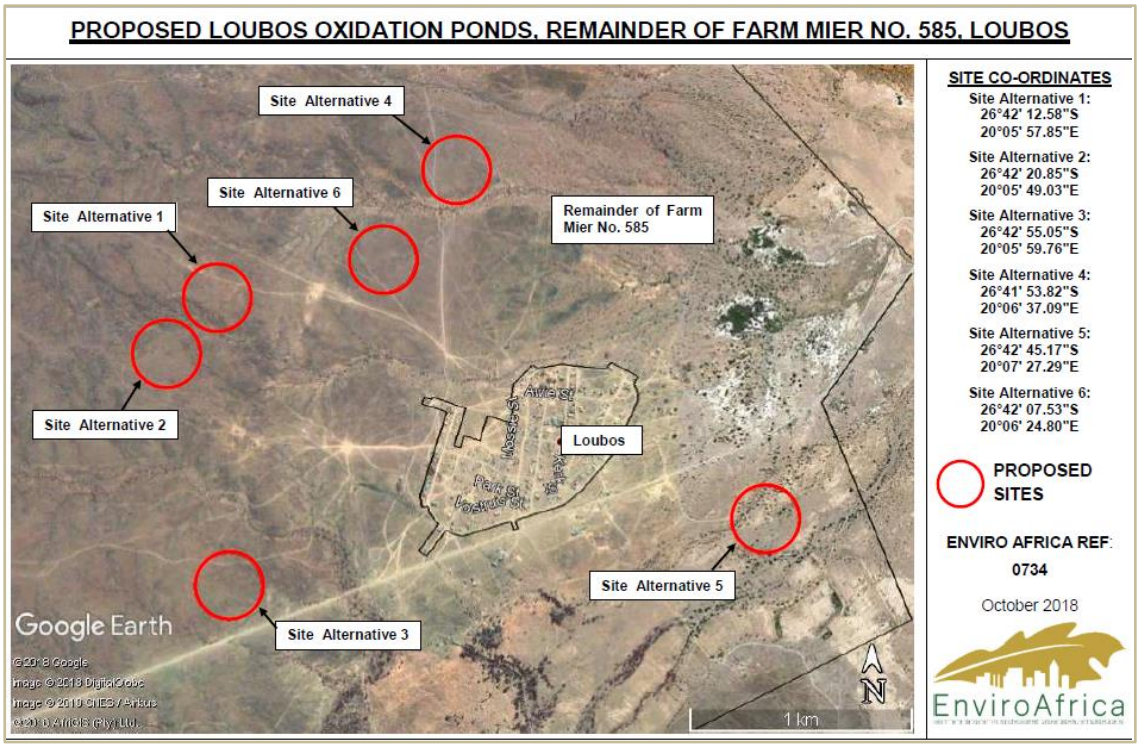



***Figure 2*** *Proposed Oxidation Ponds, Remainder of the Farm Mier No. 585, Loubos. Map provided by EnviroAfrica cc.*

## 4.2 Description of affected environment

Loubos, situated within the Dawid Kuiper Local Municipality falls within the Nama-Karoo biome and Kalahari Karroid Shrubland bioregion (Mucina & Rutherford 2006). Kalahari Karroid Shrubland are typically found within alternating belts of Gordonia Duneveld on plains northwest of Upington through Lutzputs and Noenieput to the Rietfontein/Mier area in the north. The affected environment around Loubos consists of low karroid shrubland on flat, gravel plains, transitioning into the Kalahari region and sandy soils. Mostly *Boscia foetida* subsp. *Foetida* (Stinkwitgatboom), *Acacia mellifera* subsp *detinens* (Swarthaak), *Acacia senegal var rostrata* (Driedoring), and invasive *Prosopis* trees were found on the various locations, along with planes

of *Stipagrostis ciliata* var *capensis, Stipagrostis uniplumis* var. *uniplumis,* and *Stipagrostis hochstetteriana.* The area's geology and soils consist of Cenozoic Kalahari Group sands and calcrete outcrops and screes on scarps of intermittent rivers, with occasional Dwyka Group tillites outcrops. The soils are deep (>300 mm), red-yellow, apedal, freely drained, with a high base status (Mucina & Rutherford 2006).

### 4.2.1 Alternatives 1 and 2

Alternatives 1 and 2 are adjacent to each other and surveyed as a unit. The area is predominantly flat *klipveld*, with slight elevations to the south and southwest and several rocky outcrops. A dry river bed runs through the sites from west to east. From Loubos settlement there are two access roads towards the sites.

***Figure 3*** *Views of affected sites, Alternatives 1 and 2*

### 4.2.2 Alternative 3

The site is flat with a high frequency of surface stones and a slight elevation to the north of the site. A small dry riverine run from north to south towards the western boundary of the site. A dry riverbed forms the northern boundary of the site. The site has been previously disturbed as an excavated trench runs from west to east through part of the site. A couple of two-track dirt roads provide access to the site and traverse the site from northwest to southeast. Alternative 3 is near the main gravel road linking Loubos and Rietfontein.

***Figure 4*** *Views of affected sites, Alternative 3*

### 4.2.3 Alternative 4

Area is mostly flat *klipveld* with an unknown dry riverbed forming the southern boundary of this potential site. The dry riverbed runs from west to east and an old dam wall and weir built in the river is still standing. The site can be approached via two-track road from the south.

***Figure 5*** *Views of affected sites, Alternative 4*

### 4.2.4 Alternative 5

Approximately 80% of the site is situated within the floodplain of the locally known “Swartbaars River”. The entire site has been severely eroded and affected by flooding from heavy seasonal rains and is densely overgrown by *Prosopis* trees within the floodplain. Portion of the site is located within a previously cultivated area. There are dam and retainer walls still present. The area appears to be utilised as a local dumping site, most probably by Loubos residents. Road construction disturbed the area towards the south of the site, close to the river.

***Figure 6*** *Views of affected sites, Alternative 5*

### 4.2.5 Alternative 6

A dry river bed forms the northern boundary of this development alternative. The site is flat *klipveld* with little vegetation. At least two dirt roads provide access towards the site from the southeast to the northwest.

***Figure 7*** *Views of the affected development area Alternative 6*

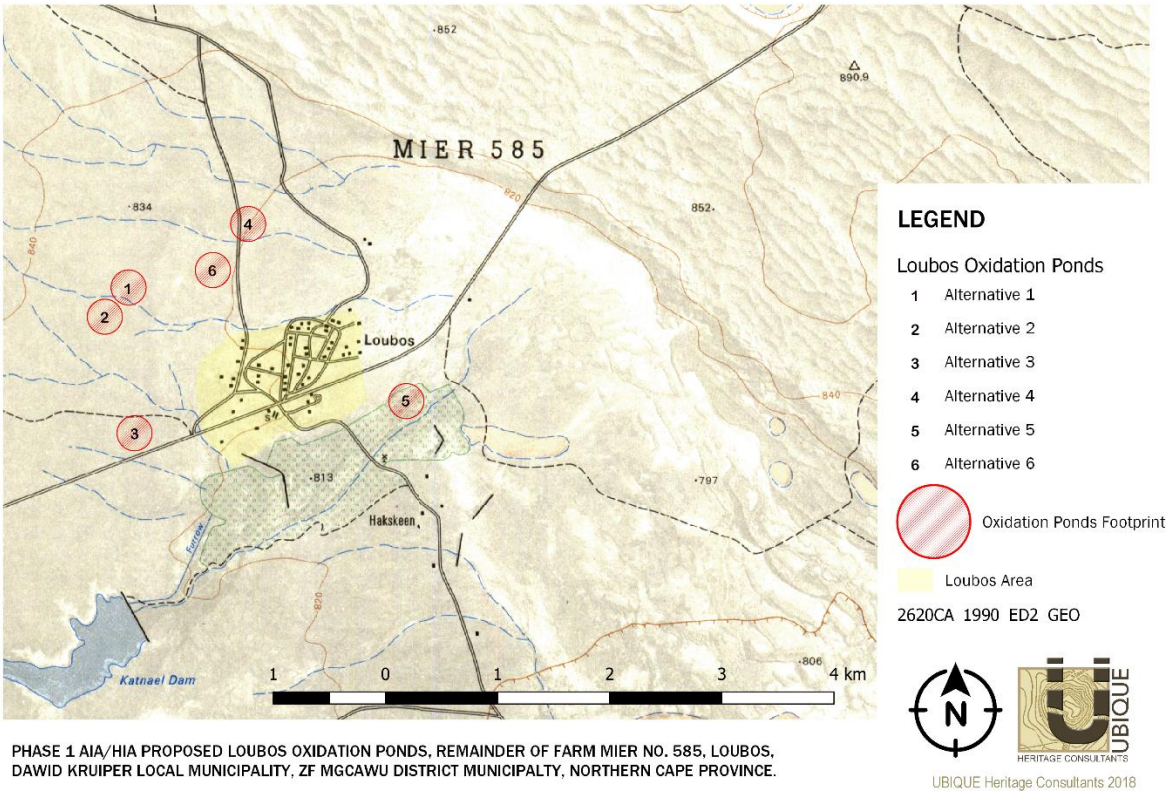



***Figure 8*** *Locality of study area indicated on 1:50 000 Topo-Cadastral map 2620CA, Surveyor General*

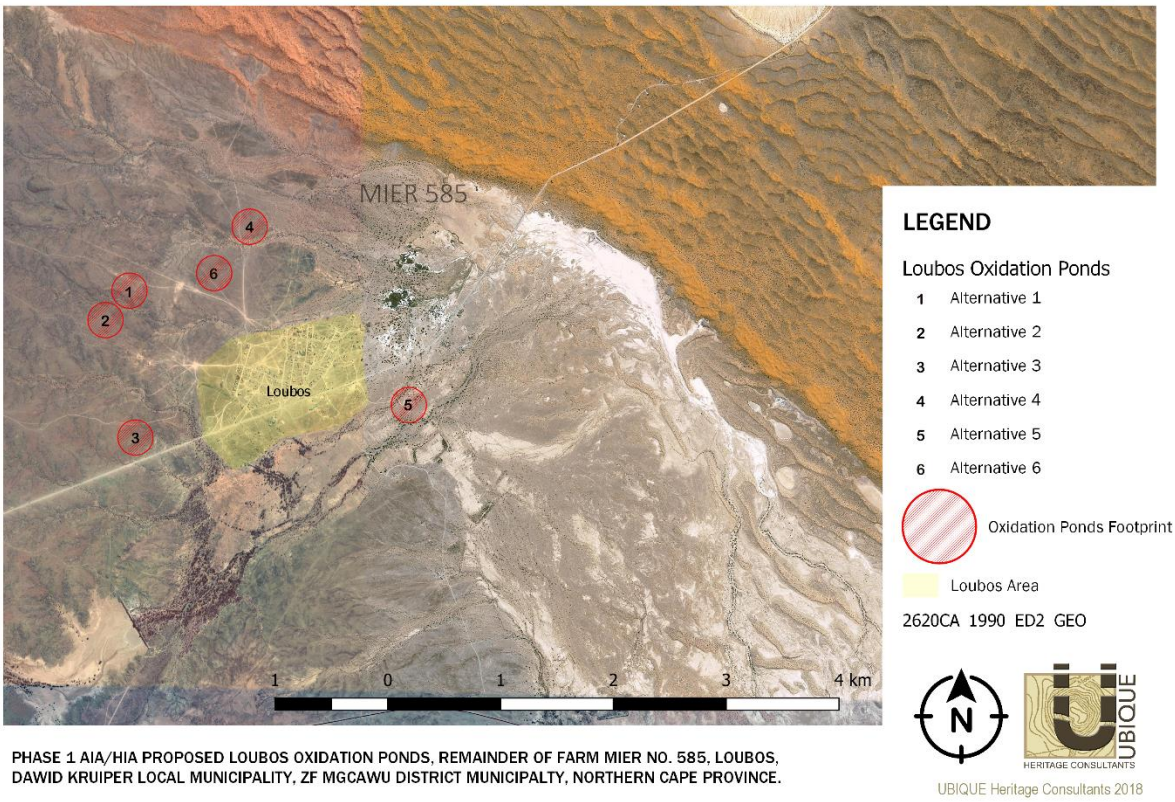



***Figure 9*** *Locality of study area indicated on Google Earth Satellite image*

# 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 in 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, Vlermuisgat, 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 of 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, Mashwening, 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; Pelser & 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 where utilized 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 their own 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, gun-runners, 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 conflict 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 very important 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

Several Heritage Impact Assessments have been conducted in the landscape surrounding, and around the study areas. Studies undertaken include investigations conducted by Beaumont (2010), Dreyer (2003; 2006a; 2006b), Engelbrecht (2013; 2014; 2015a; 2015b), Kaplan (2014), Morris (2006; 2016) and Van Pletzen-Vos & Rust (2013a; 2013b; 2013c; 2013d).

### 5.2.1 Stone Age

Van Pletzen-Vos & Rust (2013a), surveyed areas adjacent to Loubos for a proposed residential development and recorded archaeological MSA material. In an area to the west of Alternative 5 for the proposed oxidation ponds, Van Pletzen-Vos & Rust (2013a) documented three large clusters of MSA flakes and cores consisting of material like quartz, quartzite, sandstone, shale and chert. In 2015 Engelbrecht surveyed locations initially earmarked for the development of the oxidation ponds for Loubos town. Engelbrecht (2015b) documented MSA lithics like those noted by Van Pletzen-Vos & Rust (2013a), but also found a slightly worked upper grindstone attributed to the LSA.

To the south of the study area, Morris (2016) conducted surveys of Hakskeenpan and the sand dunes surrounding the pan. Morris noted some flaked quartzite and Dwyka tillite pebbles on the pan floor, and several isolated finds on the dunes, which could indicate a palimpsest of repeated transient inhabitations. In an area just south of Loubos, Morris also found Middle Stone Age and possible Acheulean (Earlier Stone Age) lithics exposed on the surface. No stratigraphy or contextual features were identified (Morris 2016).

Various archaeological remains have been recorded at Rietfontein, approximately 11 km southwest of Loubos. Smith (1995) describes the results of various archaeological surveys in the region. Samples of cultural material taken from flattened hollows on the dunes included pottery sherds, quartz, quartzite, silcrete, and shale flakes, cores and chunks and a lithic manuport. Van Pletzen-Vos & Rust (2013b) observed archaeological remains spanning the Earlier Stone Age (ESA), Middle Stone Age (MSA) and the Later Stone Age (LSA) on the site of a proposed residential development at Rietfontein. They noted that is very rare to find all three stone tool technologies on one site. Seven ESA lithics were found, representing the Acheulian Technological period. All Acheulian pieces were made from sandstone. The MSA contributed the bulk of the lithic assemblage with 77 flakes of various descriptions and 38 cores documented. Material included: sandstone, quartz, quartzite, jasper and chert. The LSA was not very well represented: only one flake (sandstone) and one core (quartzite) were found. Furthermore, five possible

burials were also located on the property (Van Pletzen-Vos & Rust 2013b). Similar lithic assemblages were documented by Engelbrecht (2013) on the outskirts of Rietfontein. Engelbrecht (2013; 2014) further mentions two LSA sites, one approximately 20 km North of Rietfontein on the Farm Gemeentesdam. amongst red Kalahari dunes, and another one located further south, at Bakrivier Farm, approximately 30km from Nakop Border Post. Engelbrecht (2013; 2014) noted similarities between the lithic material from Rietfontein, Gemeentesdam, and Bakrivier. The material from all three sites were similar in type and raw material utilised, suggesting a regional link.

On a survey for the proposed Kalahari-East Bulk Water Supply Scheme between Askham and Philandersbron, Kaplan (2014) identified a handful of stone implements including several MSA quartzite and indurated shale flakes, chunks, and a quartzite disc, prepared cores, a jasperlite flake, flaked cobbles and a chunky weathered, retouched indurated shale `knife' (Kaplan 2014).

### 5.2.2 Historical period

Dawid Kruiper Local Municipality was established after the amalgamation of Mier Local Municipality and //Khara Hais Local Municipality in 2016. The area was inhabited by bands of San when chief Dirk Vilander, with his family and *Baster* followers arrived in the "Mierland" area in 1867. According to legend, the name Mierland relates to an incident when Vilander scooped water to his mouth from a waterhole and discovered that the water was full of ants (Afrikaans: *miere*). The larger area was known as Mierland, with Rietfonten as its capital (Naude & Naude 2017). The first European pioneers in the Mierland, such as Spangenberg, Rautenbach, Le Riche, and Kennedy, were traders. Stock farmers like the Blaauws, Burgers, Krugers, Noltes, Van Schalkwyks, and Van Zyls, only entered the historical scene between 1890 and 1900, first as nomadic farmers, but eventually settling on land bought from coloured people with the permission from Vilander (Naude & Naude 2017). In 1885, the establishment of the Rhenish Mission Society mission station under the direction of Reverend Pabst at Rietfontein, led to the development of the town. By 1907, the town consisted of a magistrate's office, the local police station with its own goal, three shops, two tennis courts and a public library (Naude & Naude 2017). The mission station closed during 1935 and a large number of the community relocated to Rehoboth, Keetmanshoop and the Cape Colony (Engelbrecht 2015b; Totemeyer 1936). The mission church has been declared a provincial heritage site (https://www.sahra.org.za/sahris/node/24196).

According to Engelbrecht (2015b), the villages of Philandersbron and Loubos (previously named Leeuwbos) were established around the central town of Rietfontein. These decentralised villages were predominantly white European farming communities who engaged in agricultural activities such as the production of maize, wheat and vegetables. After the proclamation of the Kalahari Gemsbok Park (now Kgalagadi Transfrontier Park) in 1931, Nama, San and coloured people were extricated from the nature reserve and resettled. The area between Rietfontein, the Namibian Border, and the Nossob River were earmarked for these displaced communities. The Union Government bought the farms that belonged to white farmers, such as Hakskeen, Leeuwbos, Groot-Mier, Klein-Mier, Rooipan, Rooivlei, and Groot-Abbas, and established the so-called Mier Reserve. The white community relocated to places like Cape Town, Windhoek and

elsewhere in the RSA and Namibia (Engelbrecht 2015b; Naude & Naude 2017). The Union Government of South Africa and later the Republican Government developed several dams for irrigation and canals to ensure water supply to certain agricultural fields around the town of Loubos (Engelbrecht 2015b).

The area around Rietfontein saw military action during the Great War (1914-1918). German and South African Union soldiers engaged in combat on 19 March 1915 during an offensive led by Captain van Vuuren against German soldiers. One squadron of South African soldiers defeated the 200 strong opposition, leaving 4 killed, 20 wounded, and two prisoners of war (Engelbrecht 2015b; The great war: Official history 1924).

### 5.2.3 Oral history

Interviews with local community elders were conducted in 2015 by Engelbrecht (2015b). His notes have been incorporated in the section above.

# 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. Alternatives 1 & 2 were surveyed as one area, while Alternatives 3-6 were surveyed as separate units. The pedestrian survey was conducted in transects throughout the development alternatives, while a vehicular survey was conducted between footprints. Dry riverine and river beds outside of the development footprints were also thoroughly surveyed.

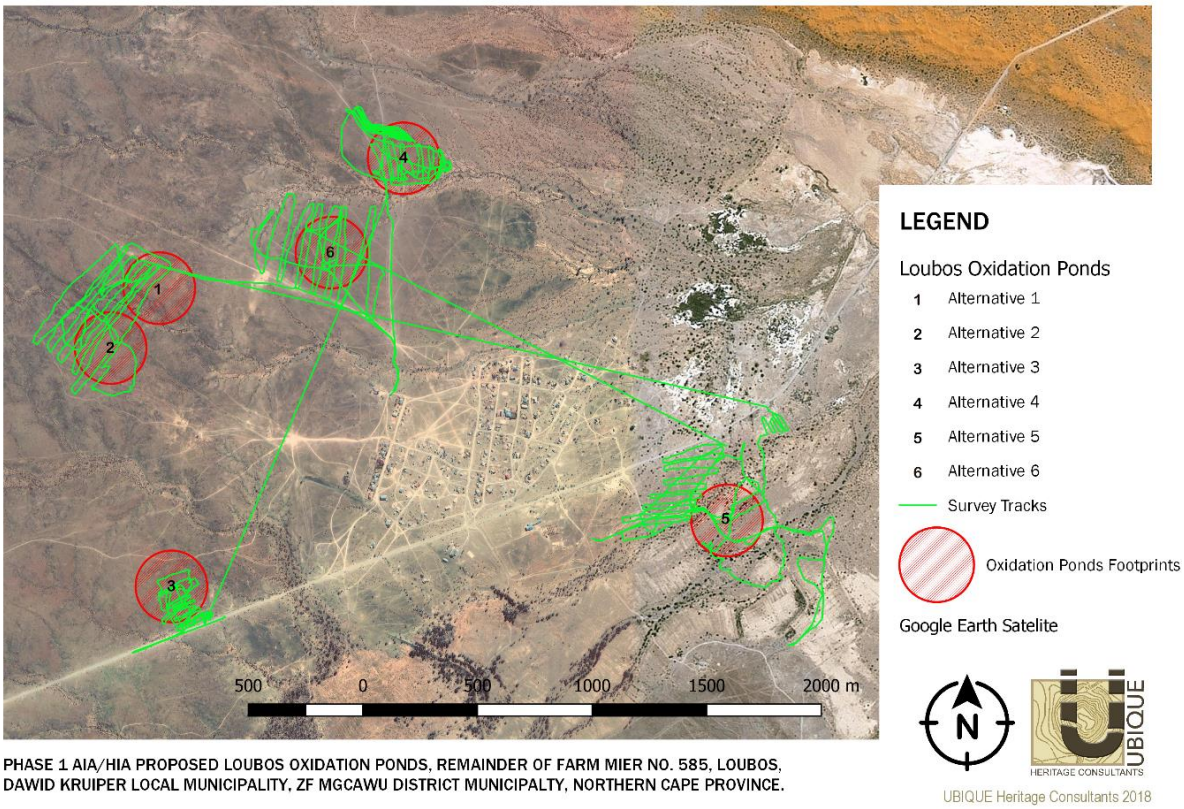



***Figure 10*** *Google Earth image showing survey track for Remainder of the Farm Mier No 585, indicated on Google Earth Satellite image.*

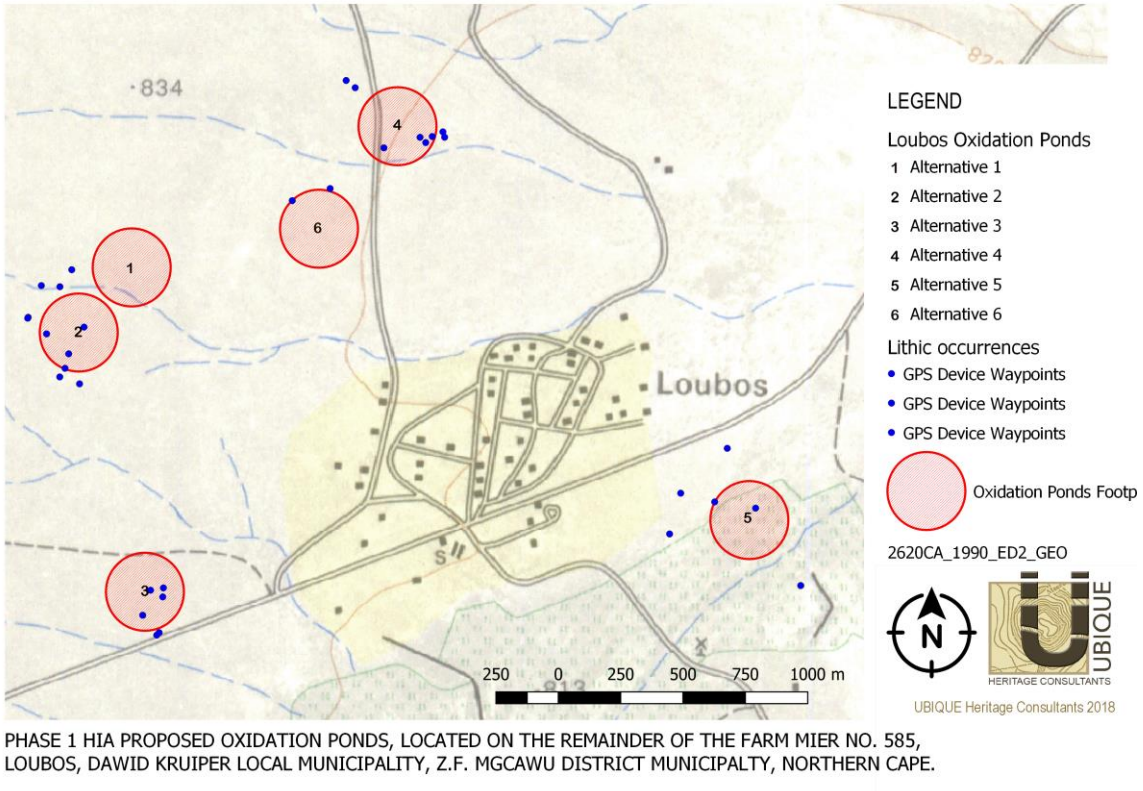



***Figure 11*** *Distribution of lithic occurrences across study area Alternatives 1 to 6, indicated on 1:50 000 map 2620CA, Surveyor General.*

## 6.2 Identified heritage resources

### 6.2.1 Alternatives 1 and 2

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 13. MSA core, punch, scraper, flakes and chunks. Lithic debris. Out of context. In area of approximately 10- 20 m². | MSA/Early LSA | 26° 42' 15.14" S 20° 05' 44.62" E | Field Rating IV C Low significance |
| 14. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 15.14" S 20° 05' 44.62" E | Field Rating IV C Low significance |
| 15. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 19.36" S 20° 05' 42.56" E | Field Rating IV C Low significance |
| 16. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 15.17" S 20° 05' 47.29" E | Field Rating IV C Low significance |
| 17. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 20.55" S 20° 05' 50.84" E | Field Rating IV C Low significance |
| 18. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 27.79" S 20° 05' 50.10" E | Field Rating IV C Low significance |
| 19. MSA Debitage (chips, chunks and flakes). No context. | MSA/Early LSA | 26° 42' 27.13" S 20° 05' 47.24" E | Field Rating IV C Low significance |
| 20. LSA upper grinder, no context. | LSA | 26° 42' 25.83" S 20° 05' 48.00" E | Field Rating IV C Low significance |
| 21. MSA small knapping site over an area of approximately 20 m² . Lithic debris, flakes, chunks, chips, cores. Concentration of lithics- medium density and frequency. | MSA/Early LSA | 26° 42' 24.01" S 20° 05' 48.56" E | Field Rating IV B Medium significance |
| 22. MSA Debitage (chips and flakes). No context. | MSA/Early LSA | 26° 42' 13.03" S 20° 05' 48.93" E | Field Rating IV C Low significance |
| Historical | | | |
| 23. No historical features were identified. | | | N/A |
| Graves | | | |
| 24. No formal or informal graves were identified. | | | N/A |

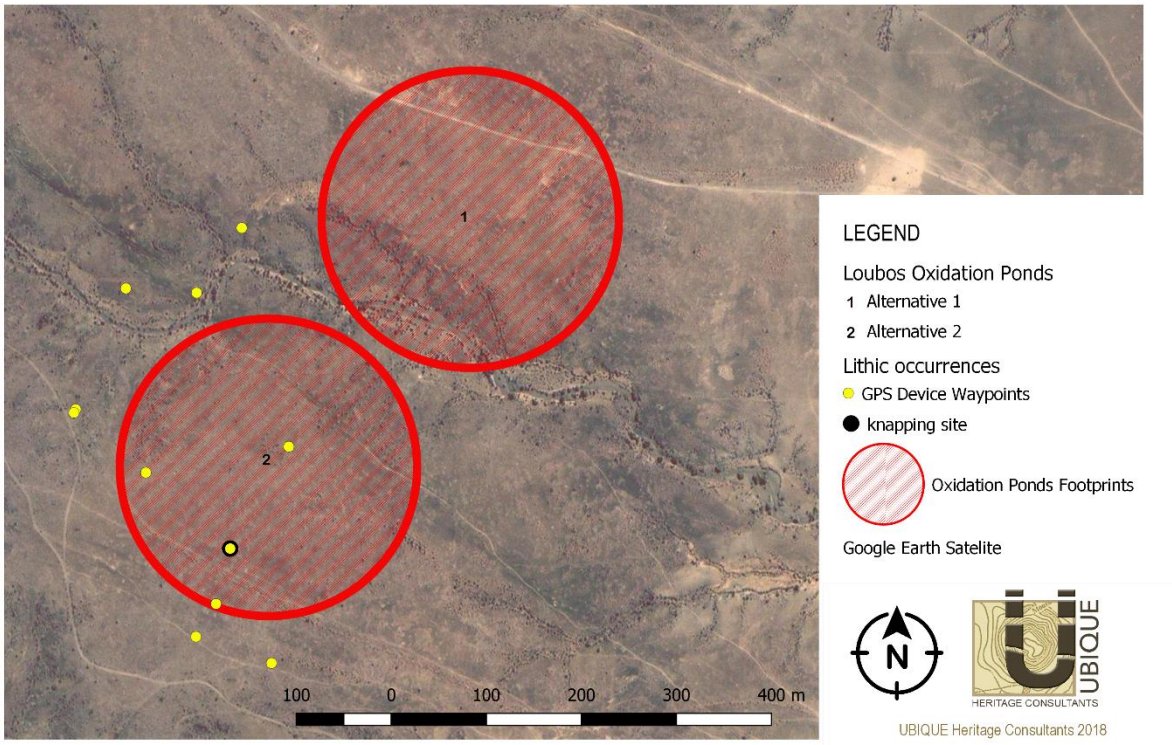



***Figure 12*** *Distribution of lithic occurrences across study area Alternatives 1 and 2, indicated on Google Earth Satellite image.*

### 6.2.2 Alternative 3

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 9. MSA punch, no context. | MSA/Early LSA | **26º 42' 55.55" S 20º 06' 02.30" E** | Field Rating IV C Low significance |
| 10. MSA scrapers, no context. | MSA/Early LSA | **26º 42' 54.42" S 20º 06' 02.37" E** | Field Rating IV C Low significance |
| 11. LSA upper grinder and LSA/MSA chunk, no context. | MSA/LSA | **26º 42' 54.68" S 20º 06' 00.52" E** | Field Rating IV C Low significance |
| 12. MSA Debitage (chips, chunks) | MSA/Early LSA | **26º 42' 57.93" S 20º 05' 59.38" E** | Field Rating IV C Low significance |
| 13. LSA/MSA Upper grinder/ punch, no context. | MSA/LSA | **26º 43' 00.49" S 20º 06' 01.38" E** | Field Rating IV C Low significance |
| 14. MSA scraper or chip, no context. | MSA/Early LSA | **26º 43' 00.18" S 20º 06' 01.74" E** | Field Rating IV C Low significance |
| Historical | | | |
| 15. No historical features were identified. | | | N/A |

| Graves | | | |
|---|---|---|---|
| 16. No formal or informal graves were identified. | | | N/A |

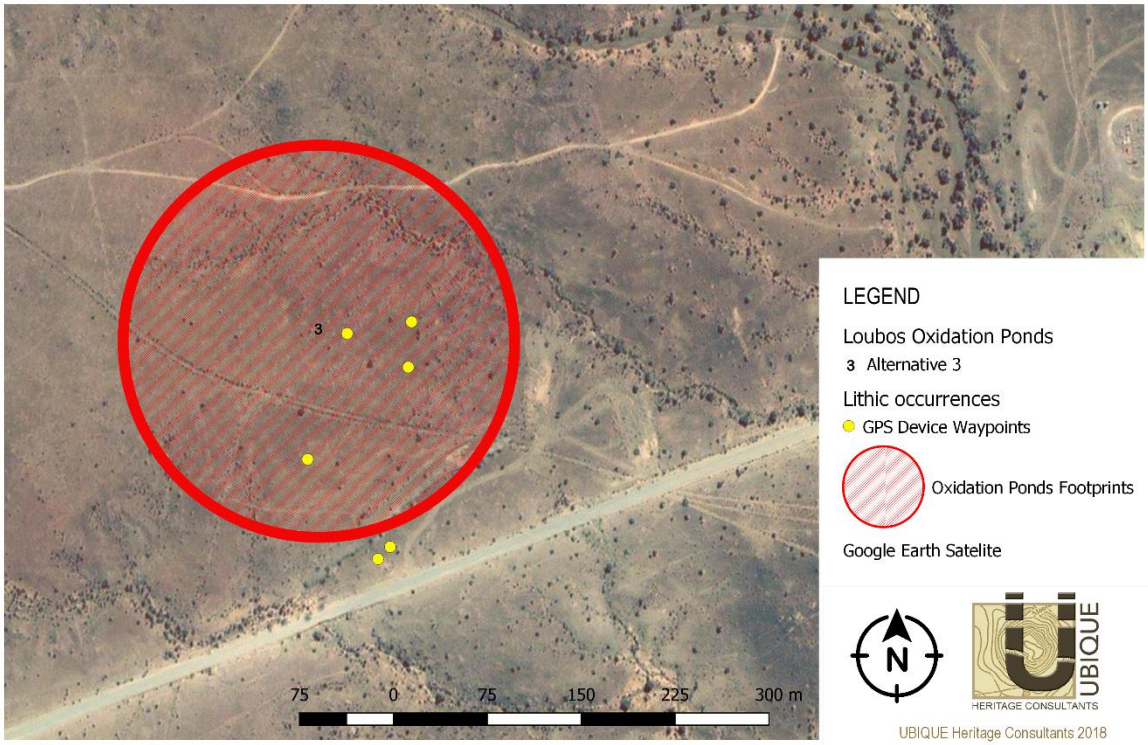



***Figure 13*** *Distribution of lithic occurrences across study area Alternative 3, indicated on Google Earth Satellite image.*

### 6.2.3 Alternative 4

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 11. Possible MSA broken punch or upper grinder, no context. | MSA/Early LSA | 26º 41' 49.37 S 20º 06' 30.06" E | Field Rating IV C Low significance |
| 12. MSA chips, chunks or flakes, no context. | MSA/Early LSA | 26º 41' 48.35 S 20º 06' 28.74" E | Field Rating IV C Low significance |
| 13. MSA chunks and flakes, debris, no context. | MSA/Early LSA | 26º 41' 55.07 S 20º 06' 42.82" E | Field Rating IV C Low significance |
| 14. MSA chips and flakes, debris, no context. | MSA/Early LSA | 26º 41' 55.77 S 20º 06' 41.35" E | Field Rating IV C Low significance |
| 15. Possible MSA cores, no context. | MSA/Early LSA | 26º 41' 56.57 S 20º 06' 40.32" E | Field Rating IV C Low significance |
| 16. Possible MSA core and flake, possible micro knapping site material. | MSA/Early LSA | 26º 41' 55.84 S 20º 06' 39.50" E | Field Rating IV C |

| | | | |
|---|---|---|---|
| | | | Low significance |
| 17. MSA core and flakes, possible micro knapping site. | MSA/Early LSA | **26° 41' 57.26 S 20° 06' 34.35" E** | Field Rating IV C Low significance |
| 18. MSA chunks and flakes, random debris, no context. | MSA/Early LSA | **26° 41' 55.90 S 20° 06' 43.10" E** | Field Rating IV C Low significance |
| Historical | | | |
| 19. No historical features were identified. | | | N/A |
| Graves | | | |
| 20. No formal or informal graves were identified. | | | N/A |

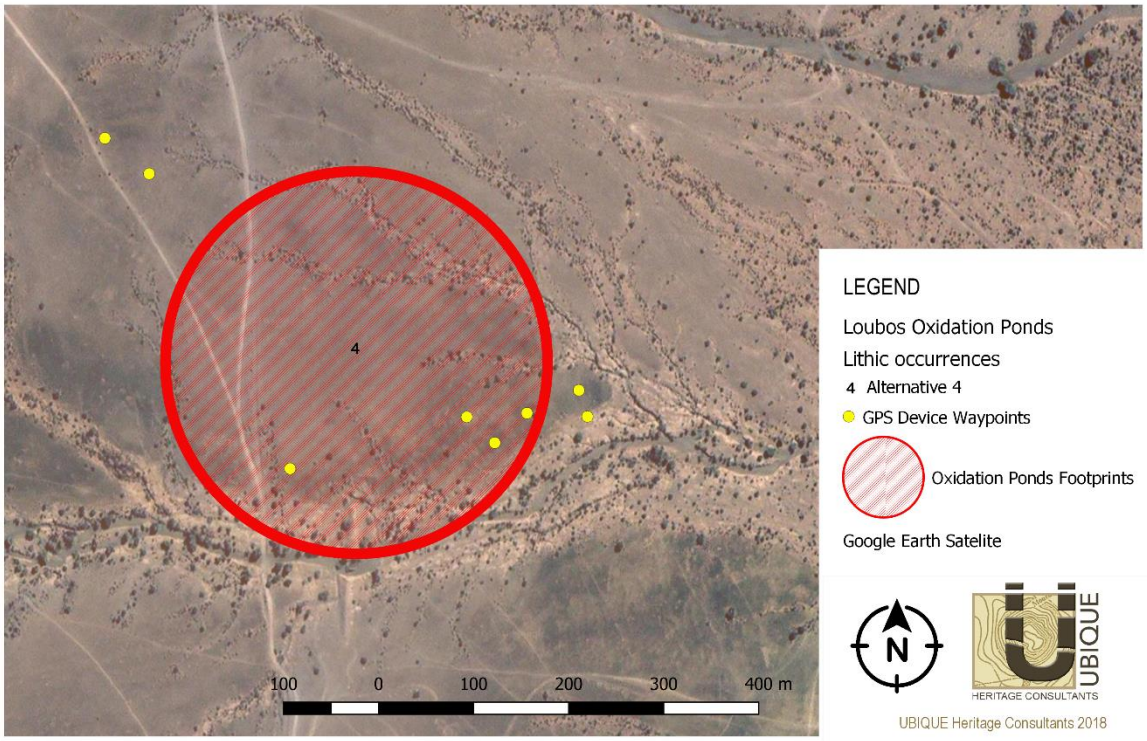



***Figure 14*** *Distribution of lithic occurrences across study area Alternative 4, indicated on Google Earth Satellite image.*

### 6.2.4 Alternative 5

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| Stone Age | | | |
| 8. MSA scraper and core, no context. | MSA/Early LSA | **26° 42' 42.93" S 20° 07' 22.11" E** | Field Rating IV C Low significance |
| 9. MSA chunks and flakes, random | MSA/Early LSA | **26° 42' 47.18" S** | Field Rating IV C |

| | | | |
|---|---|---|---|
| debris, no context. | | 20° 07' 15.61" E | Low significance |
| 10. MSA chunks, chips and core. Random debris, possible micro knapping area. | MSA/Early LSA | 26° 42' 41.89" S<br>20° 07' 17.31" E | Field Rating IV C<br>Low significance |
| 11. MSA chunks, chips and core. Random debris, possible micro knapping area. | MSA/Early LSA | 26° 42' 41.89" S<br>20° 07' 17.31" E | Field Rating IV C<br>Low significance |
| 12. MSA chips and flakes, random debris, no context. | MSA/Early LSA | 26° 42' 36.29" S<br>20° 07' 23.99" E | Field Rating IV C<br>Low significance |
| 13. MSA flakes, small core and hollow scraper. | MSA/Early LSA | 26° 42' 43.78" S<br>20° 07' 28.01" E | Field Rating IV C<br>Low significance |
| 14. MSA flakes and chip, random debris, no context. | MSA/Early LSA | 26° 42' 54.10" S<br>20° 07' 34.89" E | Field Rating IV C<br>Low significance |
| Historical | | | |
| 4. Dam wall/retainer wall for previous cultivation. 1920-30s- 1980s | | 26° 42' 50.09" S<br>20° 07' 36.03" E | |
| 5. Dam wall/retainer wall for previous cultivation. | | 26° 42' 53.71" S<br>20° 07' 36.15" E | |
| Graves | | | |
| 6. No formal or informal graves were identified. | | | N/A |

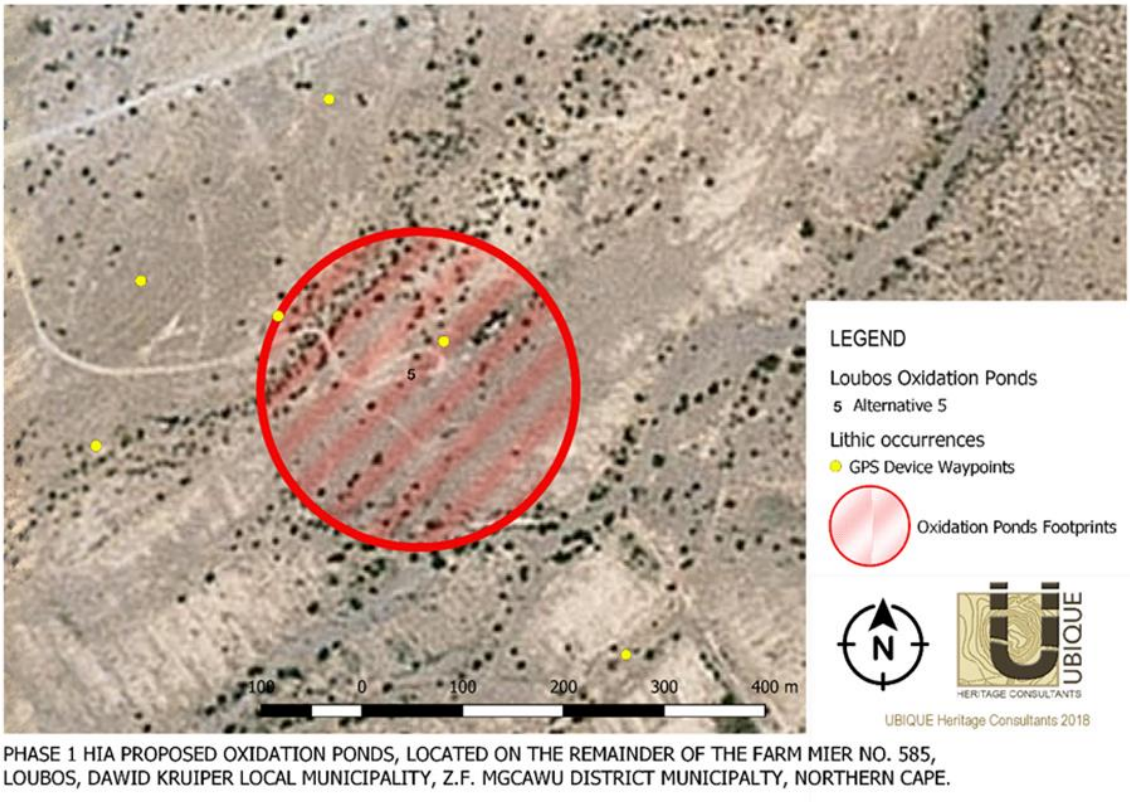



***Figure 15*** *Distribution of lithic occurrences across study area Alternative 5, indicated on Google Earth Satellite image.*

### 6.2.5 Alternative 6

| Description | Period | Location | Field rating/ Significance |
|---|---|---|---|
| **Stone Age** | | | |
| 5. MSA flakes, random debris, no context. Low density and frequency 9 flakes per 20 m². | MSA/Early LSA | **26° 42' 02.58" S 20° 06' 26.51" E** | Field Rating IV C Low significance |
| 6. MSA small knapping site. Scatters of MSA debris over an area of approximate 50 m². Cores, flakes, scrapers, chunks and other. | MSA/Early LSA | **26° 42' 04.12" S 20° 06' 20.97" E** | Field Rating IV B Medium significance |
| **Historical** | | | |
| 7. No historical features were identified. | | | N/A |
| **Graves** | | | |
| 8. No formal or informal graves were identified. | | | N/A |

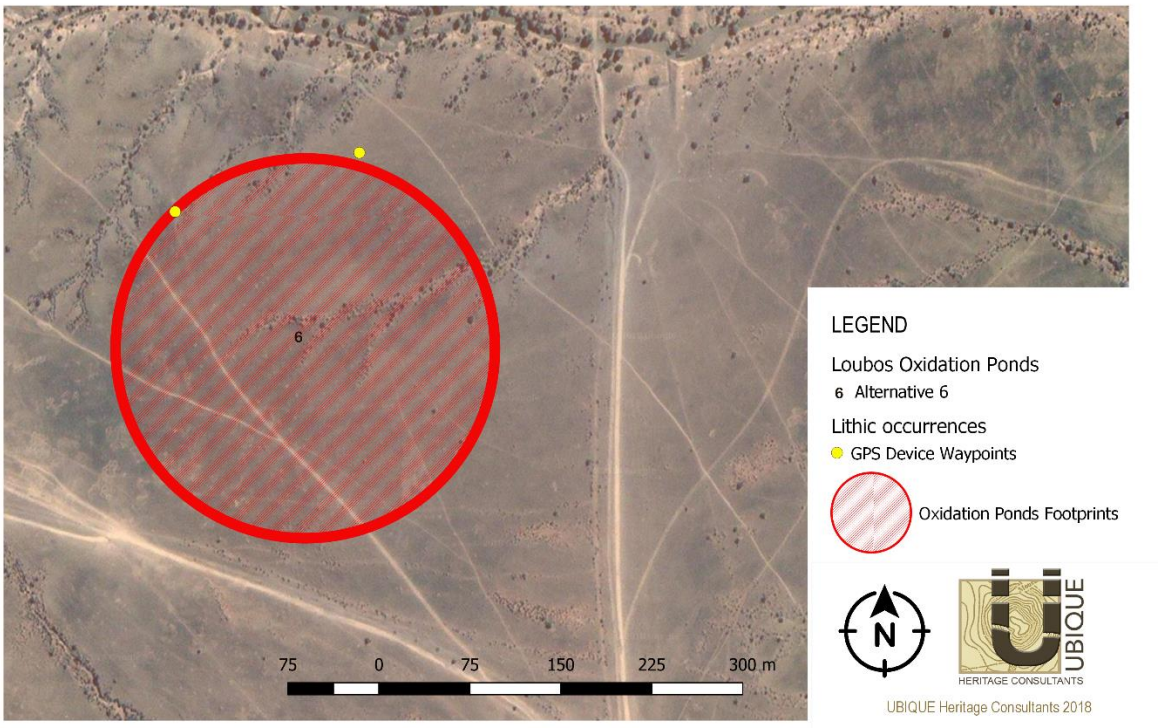



***Figure 16*** *Distribution of lithic occurrences across study area Alternative 6, indicated on Google Earth Satellite image.*

## 6.3 Discussion

### 6.3.1 Archaeological features

#### *6.3.1.1 Alternatives 1 & 2*

A total of ten incidences of Stone Age material were found across the surveyed area marked as Alternatives 1 & 2 (Figures 12 & 17). Four lithic occurrences were documented within the development footprint Alternative 2, while no lithic material was observed within the boundaries of Alternative 1. Furthermore, three locations of lithic material were recorded outside the northern boundary of Alternative 2, one to the northwest, and two locations towards the south. Predominantly the lithic assemblages consist of chunks, flakes, and knapping debris scattered ex situ in low densities (n<5 per m²). Raw material includes quartz, quartzite, sandstone, shale and chert. The cultural material recorded shows various degrees of weathering and is representative of the Early Later Stone Age and the Middle Stone Age. One site, within the southwestern quadrant of Alternative 2 (see Figure 12), has a higher density of lithics (n>5/m²; n<10/m²) in area of approximately 20 m². The higher quantity of knapping debris could be indicative of a small knapping site.

Isolated, the identified archaeological materials are of low significance, as the archaeological samples are small and without context, and therefor of little scientific value. However, due to the concentrated frequency and density of the lithic scatters across the landscape around Alternatives 1 & 2, holistically the material is of medium significance and it is recommended that these two alternatives be avoided or mitigated before development could commence.

These Stone Age heritage finds are given a General protection B (IV B). This means sites should be recorded before destruction.

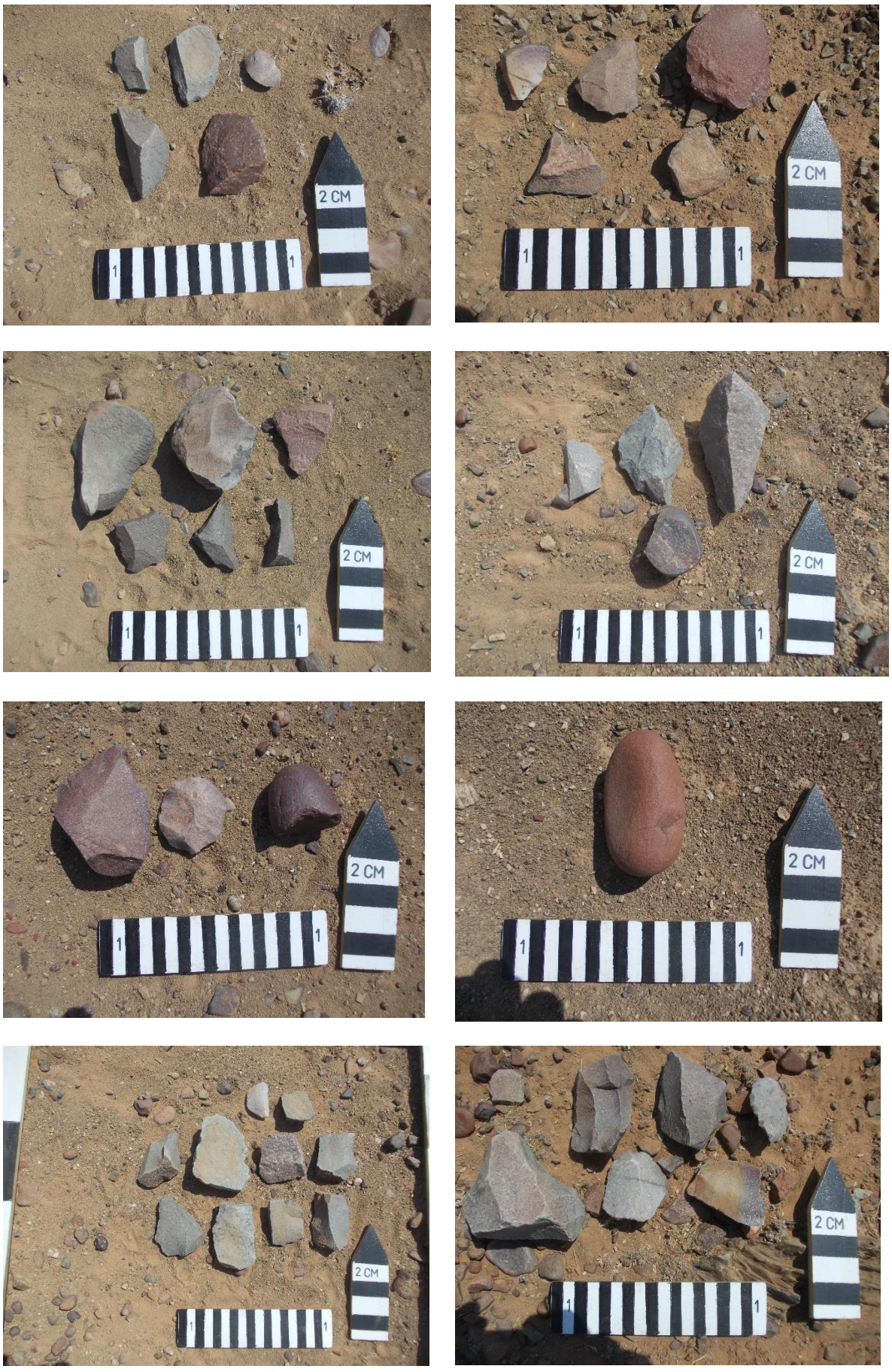




***Figure 17*** *Lithics found across Alternative 2.*

*6.3.1.2 Alternative 3*

Six incidences of Stone Age material were found across the surveyed area marked as Alternatives 3 (Figures 13 & 18). Four lithic occurrences were documented within the southern half of the development footprint, and lithic material was observed at two locations just south of the development footprint boundary. The lithics observed include MSA punches, chunks, flakes, and a scraper scattered ex situ in low densities (n<5 per $m^2$). Raw material includes quartz, quartzite, shale and chert. The identified archaeological materials are of low significance, as the archaeological samples are small and without context, and therefor of little scientific value.

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



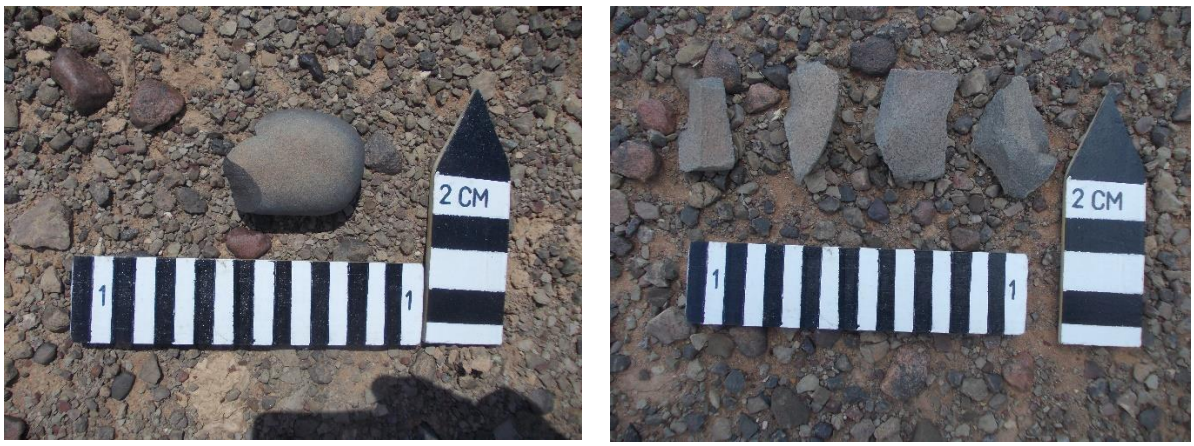


***Figure 18*** *Lithics found across Alternative 3.*

#### *6.3.1.3 Alternative 4*

Within the parameters of Alternative 4, four incidences of Stone Age material were found towards the southeast and southwest of the surveyed footprint (Figures 14 & 19). Lithics were found at two locations towards the northwest of the development footprint, and two locations towards the east. The lithics assemblages include isolated MSA punches, chunks, and hornfell corbel cores with a palimpsest of knapping material like quartz, quartzite, shale and chert flakes and chips found ex situ in low densities (n<5 per m²). The identified archaeological materials are of low significance, as the archaeological samples are small and without context, and therefor of little scientific value.

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



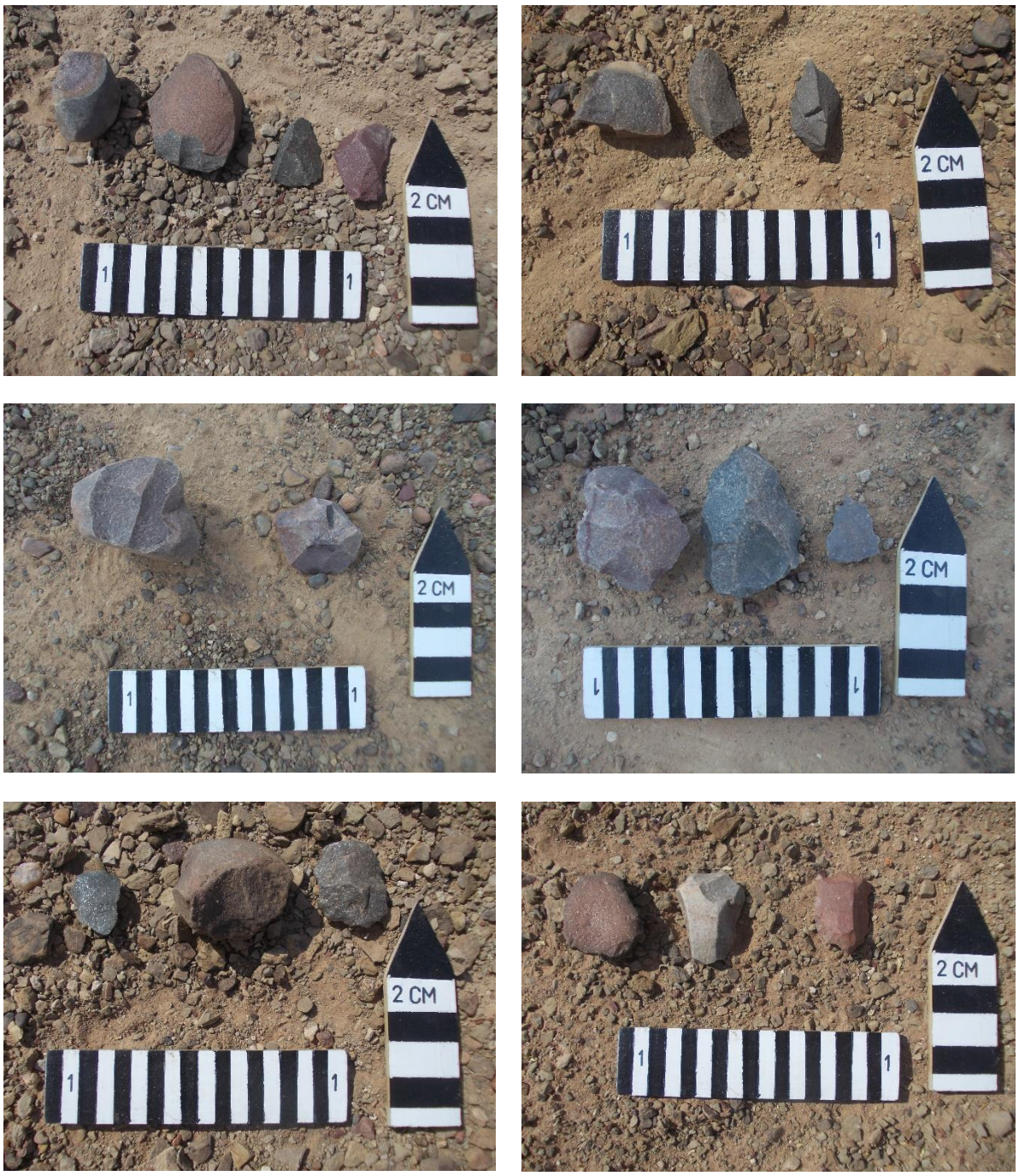



***Figure 19*** *Lithics found across Alternative 4.*

#### *6.3.1.4 Alternative 5*

Only two incidences of Stone Age material were found across the surveyed area marked as Alternatives 5, one on the north-western boundary, and the other just north of the centre (Figures 15 & 20). Four more lithic occurrences were documented outside the development footprint to the north, northwest, and south. Recorded lithics include quartzite chunks, flakes, knapping debris and MSA scrapers, including a notched scraper. The lithic assemblages were found in low densities (n<5 per m²) scatters without context. Alternative 5 is situated within the within the floodplain of the locally named Swartbaars River, and the area has been disturbed by previous agricultural activities and erosion. This would account for the various degrees of

weathering and lack of context of the cultural material recorded. The identified archaeological materials are of low significance, as the archaeological samples are small and without context, and therefor of little scientific value.

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

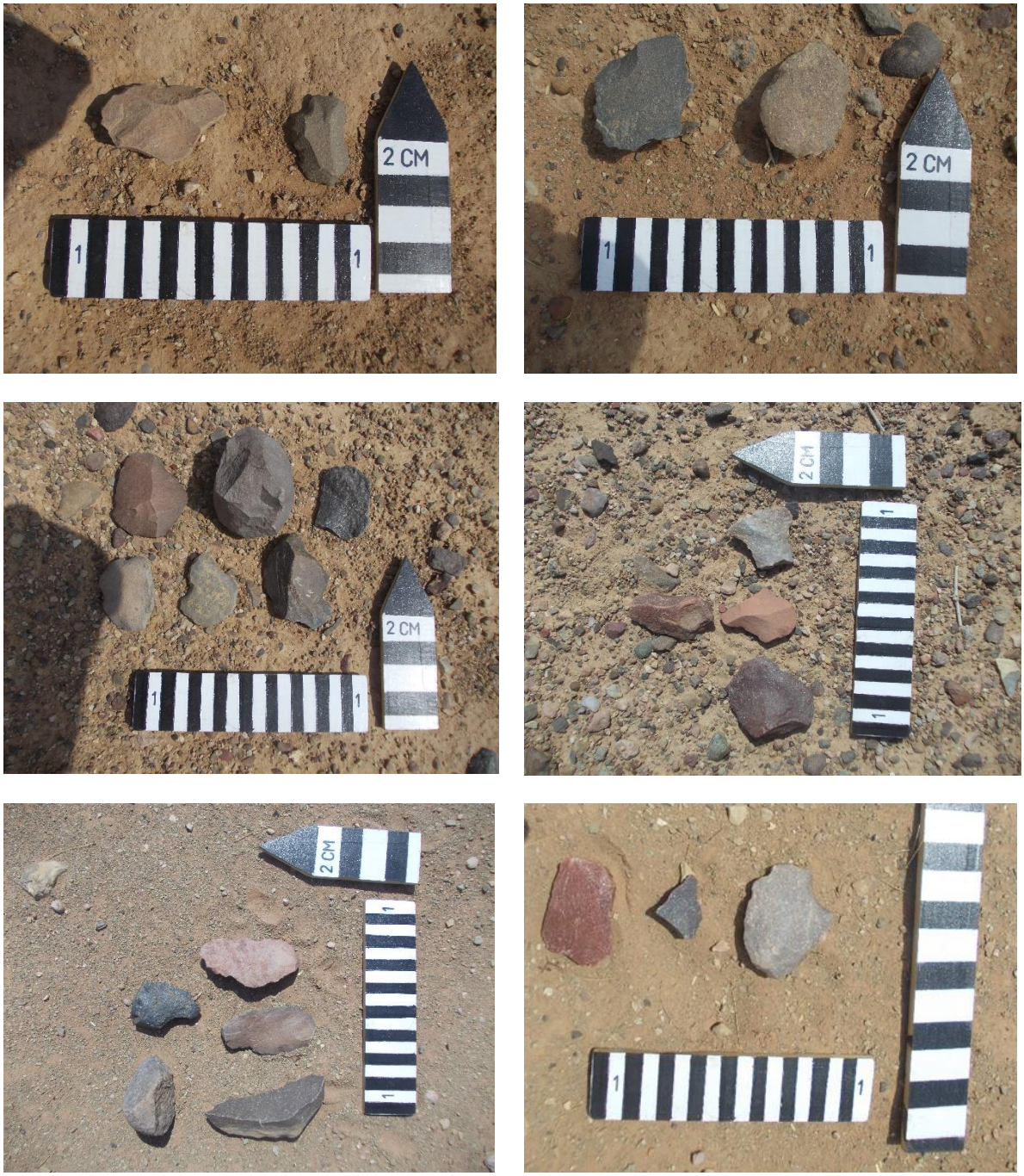



*Figure 20 Lithics found across Alternative 5.*

#### *6.3.1.5 Alternative 6*

Two isolated occurrences of Stone Age material were found on and adjacent to the northern boundary during the survey of Alternatives 6 (Figures 16 & 21). The lithics on the outside of the development footprint include MSA flakes and debitage in a low-density scatter (n<9 per 20 m²). The lithics found on the footprint's northern boundary are consistent with the remains of a small knapping site and includes scatters of MSA debris, cores, flakes, scrapers, chunks over an area of approximately 50 m². Raw material includes quartz, quartzite, shale and chert.

The identified archaeological materials on the outside of the footprint are of low significance, as the archaeological samples are small and without context, and therefor of little scientific value. These Stone Age heritage finds are given a 'General' Protection C (Field Rating IV C). This means these sites have been sufficiently recorded (in the Phase 1). It requires no further action.

The small knapping site on the boundary of Alternative 6 is of medium significance however and should be mitigated before this site is utilised. These Stone Age heritage finds are given a General protection B (IV B). This means sites should be recorded before destruction.

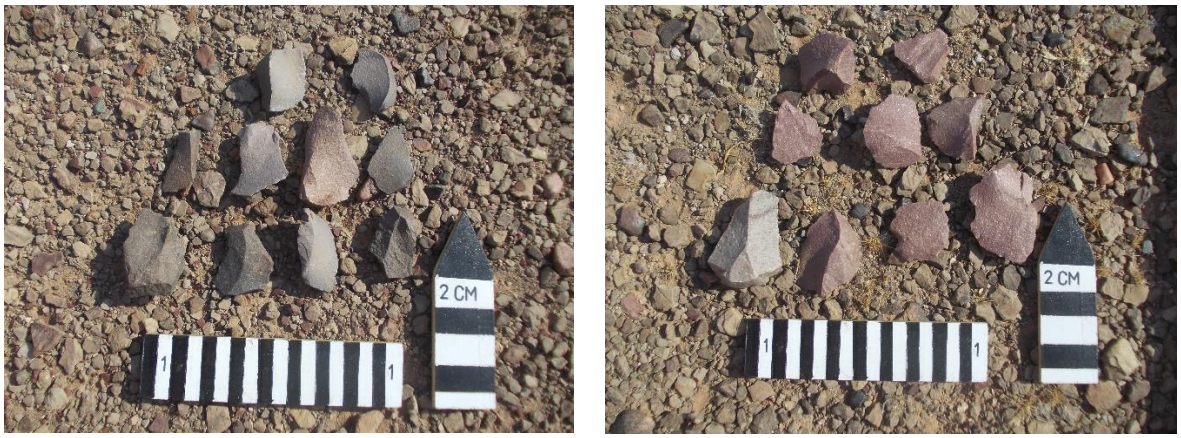



***Figure 21*** *Lithics found across Alternative 6.*

### 6.3.2 Historical features

The remains from old dams and weirs built into the river and tributaries were observed at Alternatives 4, 5 & 6. Oral history (Engelbrecht 2015b) dates these structures to irrigation schemes undertaken by the Union Government of South Africa in the 1920s and 1930s, and the Republican Government in the 1980s to ensure water supply to agricultural fields. These structures have a local significance for the town of Loubos, but their significance is low as they are not unique or typical examples of past periods. It is unlikely that that the proposed oxidations ponds will have a negative on these structures. They are given a 'General' Protection C (Field Rating IV C). This means these sites have been sufficiently recorded (in the Phase 1). It requires no further action.

***Figure 22*** *Weir and dams across surveyed areas.*

### 6.3.3 Graves

No formal or informal graves were identified in the study area.

### 6.3.4 Palaeontological resources

A Palaeontological Impact Assessment desktop study was completed on our behalf by Elize Butler (Banzai Environmental (Pty) Ltd). The PIA concludes that five of the six proposed alternative oxidization ponds are underlain by the Dwyka Group while Alternative 5 (located far east) is situated in the Kalahari Group (see Appendix 1). The Dwyka sediments are of low palaeontological sensitivity while the fossil assemblages of the Kalahari are generally very low in diversity and occur over a wide range (Almond & Pether 2009; Butler 2018). As all the alternatives of the oxidization ponds fall in an area of Low Palaeontological significance there is no preferred alternative.

## 7. 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:

5. The lithic traces on the landscape of proposed Alternatives 1, 3, 4, and 5 are of low significance and the impact of the development on these resources are inconsequential. Alternative 5 lies within a flood plain, and although the impact on heritage resources is negligible, might not be a feasible option. No further mitigation is required regarding heritage resources. Therefore, from a heritage point of view we recommend that the proposed development can continue any of these proposed Alternatives.

6. Alternatives 2 and 6 have lithics scatters that are deemed as Medium Significance and should be mitigated before development can commence on these proposed Alternatives. Mitigation would require sampling, mapping and recording of sensitive areas. Furthermore, care should be taken to avoid these areas completely until its significance can be fully accessed by a professional, especially during construction at any of the more feasible Alternatives.

7. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. 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. If fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably in situ) and the ECO must report to SAHRA so that appropriate mitigation (e.g. recording, collection) can be carried out by a professional palaeontologist (Butler 2018).

8. 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 possible discovery of finds such as stone tool scatters, artefacts, human remains, or fossils are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

# 8. CONCLUSION

This HIA has investigated six different locations for the proposed development of oxidation ponds for the town of Loubos, situated on Remainder of the Farm Mier No. 585, within the Dawid Kruiper Local Municipality, Z.F. Mgcawu District Municipality, Northern Cape Province.

Various heritage resources have been identified and recorded and we recommend Alternatives 1, 3, 4, or 5 as feasible locations with the least negative impact on archaeological material.

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## WEB

http://www.sahra.org.za/sahris

# APPENDIX A

## PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED LOUBOS OXIDATION PONDS ON THE REMAINDER OF FARM MIER NO. 585, LOUBOS DAWID KRUIPER LOCAL MUNICIPALITY, NORTHERN CAPE

# PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED LOUBOS OXIDATION PONDS ON THE REMAINDER OF FARM MIER NO. 585, LOUBOS, DAWID KRUIPER LOCAL MUNICIPALITY, NORTHERN CAPE

**Compiled for:**

UBIQUE Heritage Consultants

PO Box 51

Askham

8814

www.ubiquecrm.com

25 NOVEMBER 2018

**Prepared by:**

BANZAI ENVIRONMENTAL (PTY) LTD

## Declaration of Independence

General declaration:

I, Elize Butler, declare that –

I act as the independent Palaeontologist 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 from a heritage practitioner 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:** Banzai Environmental (Pty) Ltd

**CONTACT PERSON:** Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE: 

The Palaeontological Impact Assessment report has been compiled taking into account the NEMA Appendix 6 requirements for specialist reports 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-<br>a) details of-<br>i. the specialist who prepared the report; and<br>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | Page ii of Report – Contact details and company and Appendix 1 |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Page ii-iii |
| c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 3 – Objective |
| (cA) an indication of the quality and age of base data used for the specialist report; | Section 4 – Geological and Palaeontological history |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 7 |
| d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment; | N/A Desktop assessment |
| e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | Section 6 Methodology |
| f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | Section 1, Section 4 |

| | |
|---|---|
| g) an identification of any areas to be avoided, including buffers; | Desktop assessment |
| h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | Section 4 |
| i) a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 6.1.– Assumptions and Limitation |
| j) 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 7 |
| k) any mitigation measures for inclusion in the EMPr; | Section 9 |
| l) any conditions for inclusion in the environmental authorisation; | N/A |
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | N/A |
| n) a reasoned opinion-<br>i. as to whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) regarding the acceptability of the proposed activity or activities; and<br>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | Section 9 – Conclusion |
| o) a description of any consultation process that was undertaken during the course of preparing the specialist report; | Not applicable. |
| p) a summary and copies of any comments received during any consultation process and where applicable all | Not applicable. To date not comments regarding |

| | |
|---|---|
| responses thereto; and | heritage resources that require input from a specialist have been raised. |
| q) any other information requested by the competent authority. | Not applicable. |
| 2) Where a government notice *gazetted* 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. | Refer to section 2 and 3 compliance with SAHRA guidelines |

## EXECUTIVE SUMMARY

UBIQUE Heritage Consultants appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment assessing the palaeontological impact of the proposed oxidation ponds on the remainder of farm Mier no 585 near the town of Loubos, Dawid Kruiper Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. 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 fossil material within the proposed development footprint and to calculate the impact of the development on the palaeontological resources.

Five of the six proposed alternative oxidization ponds are located in the Dwyka Group while one pond (located far east) is situated in the Kalahari Group. According to the SAHRIS PalaeoMap the Dwyka and the Kalahari Group have a Low Palaeontological significance. As all of the alternatives of the oxidization ponds fall in an area of Low Palaeontological significance there is no preferred alternative. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. 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.

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carry out by a professional paleontologist. SAHRA Contact details: South African Heritage Resources Agency, 111 Harrington Street, PO Box 4637, Cape Town 8000, South Africa. Email: Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509 Web: www.sahra.org.za)

Preceding any collection of fossil material, the specialist would need to apply for 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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## INTRODUCTION

The Dawid Kruiper Local Municipality plans the development of oxidation ponds on the remainder of farm Mier no 585 near the town of Loubos, Dawid Kruiper Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. EnviroAfrica was appointed by the Municipality to undertake the NEMA for the Environmental Authorisation process and Water Use License Application (WULA), and the public participation process, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended. EnviroAfrica in turn appointed UBIQUE Heritage Consultants to conduct the Heritage Impact Assessment (HIA) which in turn appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment (PIA) assessing the palaeontological impact of the proposed oxidation pond.

The following activities were triggered in terms of NEMA EIA Regulations 2014:

- Government Notice R327 (Listing Notice 1): Activity No. **12**
- Government Notice R324 (Listing Notice 3): Activity No. **12, 14**

*****(N*ote that the listed activities may change during the NEMA Application process. Registered I&APs will be notified of any changes).*

The proposed new oxidation ponds will be constructed near the town of Loubos (Figure 1). These oxidation ponds will consist of: 2 x Anaerobic Ponds (525 $m^3$), 1 x Facultative Pond (1013 $m^3$), 2 x Aerobic Ponds (2025 $m^3$) and 1 x Final Storage Pond (700 $m^3$). The total surface area of the oxidation ponds will be 0.24ha in extent.

The sewerage will be collected from the existing conservancy tanks in Loubos and be transported and disposed of in the proposed oxidation ponds for treatment.

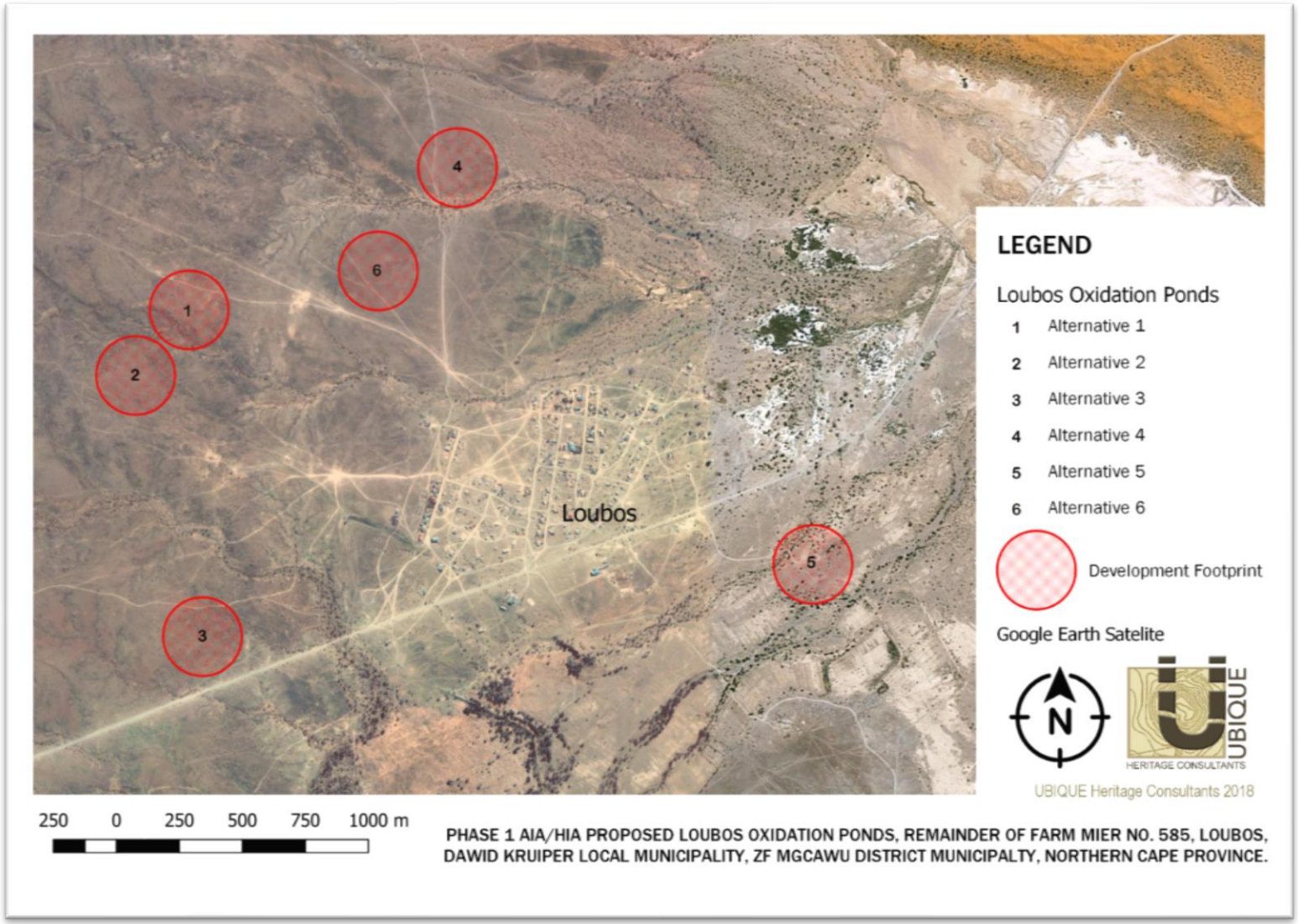


***Figure 23**: The 6 proposed oxidization ponds near Loubos on the reminder of the farm Mier no 585, Loubos, Dawid Kruiper Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Map provided by Ubique Heritage Consultants.*

## LEGISLATION

### 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 without 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 adhere 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 $m^2$ 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 $m^2$ in extent;

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

## OBJECTIVE

The objective of a DPIA is to determine the impact of the development on potential palaeontological material at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the PIA are: 1) to **identify** the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the **palaeontological importance** of the formations 3) to determine the **impact** on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a DPIA are as follows:

### General Requirements:

Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;

Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements;

Provide a thorough overview of all applicable legislation, guidelines;

Identification sensitive areas to be avoided (including providing shapefiles/kmls);

Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:

a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.

c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Comparative assessment of alternatives (infrastructure alternatives have been provided):

Recommend mitigation measures in order to minimise the impact of the proposed development; and

Implications of specialist findings for the proposed development (e.g. permits, licenses etc).

## GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE

Five of the six proposed alternative oxidization ponds are located in the Dwyka Group while one pond (pond 5, located far east) is situated in the Kalahari Group (Figure 2).

## PALAEONTOLOGY

DWYKA GROUP

The Dwyka sediments are of low palaeontological sensitivity. The Permo-Carboniferous Dwyka Group is known for its track ways also known as ilchnofacies that was formed by fish and arthropods. Fossilized faeces or coprolites have also been recovered. Body fossils consists of gastropods, invertebrates and marine fish, as well as fossil plants. A rich diversity of conifers, cordaitaleans, glossopterids, ginkgoaleans, pollens and spores have been described from this Group while ferns, horsetails and lycopods, are also found.

Kalahari Group (**Ceanozoic superficial deposits)**

The Kalahari Group fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes comprise of significant fossil biotas. Fossils assemblages may comprise of mammalian teeth, bones and horn corns (including hyena dens and owl pellets), reptile skeletons and fragments of ostrich eggs. Microfossils, terrestrial mollusc shells and freshwater stromatolites are also known from these deposits. Plant material such as foliage, wood, pollens and peats are recovered as well as trace fossils like vertebrate

tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts). Amphibian and crocodile remains have been uncovered where the depositional settings in the past were wetter. These sediments are Palaeontology poorly studied.

## GEOLOGY

Dwyka Group

*Table 2: Subdivision of the Dwyka Group. (Modified from Rubidge, 1995)*

| Period | Supergroup | Group | Formation West of 24° E | Formation East of 24° E | Free State / KwaZulu Natal |
|---|---|---|---|---|---|
| Carboniferous | Karoo Supergroup | Dwyka Group | Elandsvlei Formation | Elandsvlei Formation | Elandsvlei Formation |

The Dwyka Group is the group of sedimentary geological formations laid down in the Karoo Basin of southern Africa in the Late Carboniferous and possibly extending into the Asselian of the early Permian. It consists mainly of tillites, laid down along the sandy shorelines of swamplands. The Dwyka is the oldest and lowermost unit of the Karoo Supergroup that is recognized throughout sub-Saharan Africa.

In the Carboniferous, southern Africa was part of Gondwana. During the Late Carboniferous the lithosphere underlying what is now the Karoo Basin migrated over the South Polar Region. This resulted in southern Gondwana being covered by a major ice sheet. As the ice sheet and subsequent glaciers melted, the sediments of the Dwyka Group were deposited in the newly formed basin (Gess, 2013). These glacial deposits include diamictites, varved shale and mudstone with drop stones, fluvioglacial gravel and conglomerates. The total thickness of the group ranges from 600 to 750 meters.

The Dwyka Group consists almost exclusively of diamictites known as the Dwyka tillite. This is a distinctive rock type which, when freshly exposed, consists of a hard fine-grained blueish-black matrix in which abundant roughly shaped clasts are embedded. These vary greatly in both lithology and size.

The Dwyka Group is considered to be Permo-Carboniferous in age, but due to ambiguities in the fossil record, more precise dating is not available. Maximum age inferred from fossils found in underlying strata is Late Devonian or Early Carboniferous, and minimum age inferred from fossils in the upper glacial deposits is Early Permian.

### Ceanozoic superficial deposits

The youngest formation of the Kalahari group is the Gordonia Formation which is generally termed Kalahari sand and comprises of red aeolian sands that covers most of the Kalahari Group sediments. These Gordonia dune sands range in age from Late Pliocene/Early Pleistocene to recent.

The Tertiary to Quaternary Ceanozoic superficial deposits (represented on Geological maps by Qs,) consist of aeolian sand, alluvium (clay, silt and sand deposited by flowing floodwater in a river valley/ delta producing fertile soil), colluvium (material collecting at the foot if a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water) and cave, lake, spring and pan deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels.:

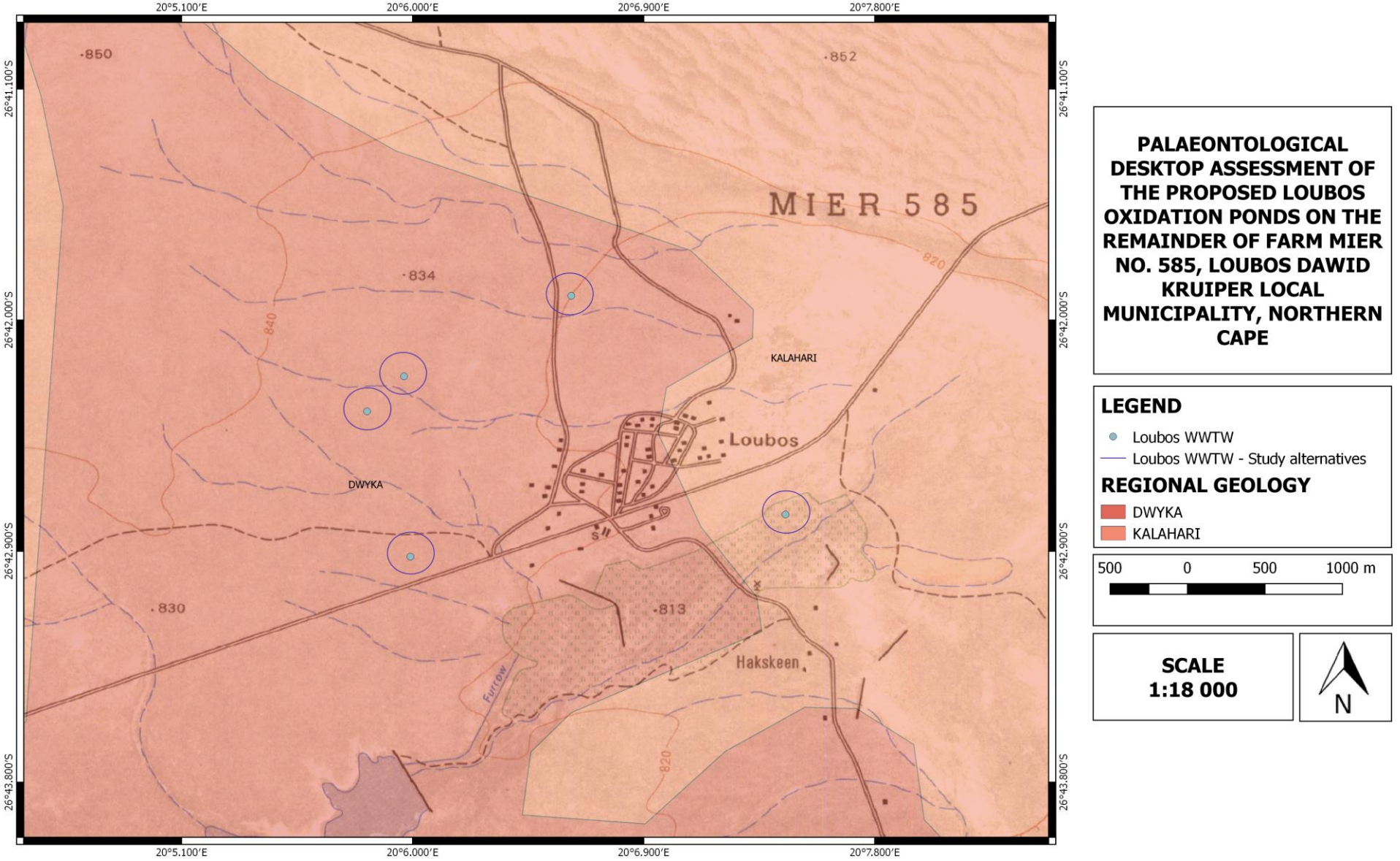


***Figure 24**: The surface geology of the 6 proposed oxidization ponds near Loubos on the reminder of the farm Mier no 585, Loubos, Dawid Kruiper Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Five of the six proposed oxidization ponds are in the Dwyka Group while one pond (located far east) is situated in the Kalahari Group. Map drawn QGIS Desktop 2.18.18.*

## GEOGRAPHICAL LOCATION OF THE SITE

The proposed development is located on Remainder of Farm Mier No. 585, near the town of Loubos. Six alternatives have been suggested for the proposed development of which all will be assessed. This development is mapped on the 1: 50 000 2620CA topographical Map.

*Table 3: Site co-ordinates*

| | |
|---|---|
| Site Alternative 1 | 26°42' 12.58"S; 20°05' 57.85"E |
| Site Alternative 2 | 26°42' 20.85"S; 20°05' 49.03"E |
| Site Alternative 3 | 26°42' 55.05"S 20°05' 59.76"E |
| Site Alternative 4 | 26°41' 53.82"S20°06' 37.09"E |
| Site Alternative 5 | 26°42' 45.17"S20°07' 27.29"E |
| Site Alternative 6 | 26°42' 07.53"S20°06' 24.80"E |

## METHODS

A desktop study is conducted to evaluate the possible risk to palaeontological heritage (this includes fossils as well as trace fossils) in the proposed development area.

The potentially fossiliferous rocks present within the development are established from 1:250 000 geological maps. The topography of the development is identified by 1:50 000 topography maps and Google Earth Images. Previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions which identify fossils found in close proximity to the development is used to identify the fossil heritage within each rock.

The palaeontological status of each rock component in the development area is calculated and the possible impact of the development on fossil heritage is determined by

a) the palaeontological importance of the rocks;

b) the scale and type of development; and,

c) the quantity of bedrock removed.

### Assumptions and limitations

The accurateness of a desktop DPIA is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material.

The entirety of South Africa has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of the desktop DPIA is improved by a field-survey.

## FINDINGS

Five of the six proposed alternative oxidization ponds are located in the Dwyka Group while one pond (pond 5, located far east) is situated in the Kalahari Group.

The Permo-Carboniferous Dwyka Group is known for its track ways also known as iIchnofacies that was formed by fish and arthropods. Fossilized faeces or coprolites have also been recovered. Body fossils consists of gastropods, invertebrates and marine fish, as well as fossil plants. A rich diversity of conifers, cordaitaleans, glossopterids, ginkgoaleans, pollens and spores have been described from this Group while ferns, horsetails and lycopods, are also found.

The Kalahari Group fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes comprise of significant fossil biotas. Fossils assemblages may comprise of mammalian teeth, bones and horn corns (including hyena dens and owl pellets), reptile skeletons and fragments of ostrich eggs. Microfossils, terrestrial mollusc shells and freshwater stromatolites are also known from these deposits. Plant material such as foliage, wood, pollens and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts). Amphibian and

crocodile remains have been uncovered where the depositional settings in the past were wetter. These sediments are Palaeontology poorly studied.

## IMPACT RATING SYSTEM

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 is used:

*Table 4:* The rating system

| | | |
|---|---|---|
| **NATURE** | | |
| Include a brief description of the impact of 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.<br><br>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 years), 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 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 partly 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:<br><br>(**Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x** | | |

| magnitude/intensity.<br><br>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 |

## CONCLUSION

Five of the six proposed alternative oxidization ponds are located in the Dwyka Group while one pond (located far east) is situated in the Kalahari Group. According to the SAHRIS PalaeoMap the Dwyka and the Kalahari Group has a Low Palaeontological significance. As all of the alternatives

of the oxidization ponds fall in an area of Low Palaeontological significance there is no preferred alternative. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. 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.

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carry out by a professional paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for 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: 1: CV*

**ELIZE BUTLER**

**PROFESSION:** Palaeontologist

**YEARS' EXPERIENCE:** 25 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 D*aptocephalus 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

Research Assistant National Museum, Bloemfontein 1993 – 1997

Principal Research Assistant National Museum, Bloemfontein

and Collection Manager 1998–currently

## TECHNICAL REPORTS

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**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. Bloemfontein.

**Butler, E. 2018.** Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Field Assessment for the proposed re-alignment and de-commisioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

**Butler, E. 2018.** Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.

**Butler, E. 2018** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division.

# APPENDIX B

SPECIALISTS CREDENTIALS

## ELIZE BUTLER

Palaeontologist

Elize Butler has 25 years of experience in Palaeontology and has conducted numerous Palaeontological Impact Assessments since 2014. She holds a B.Sc. degree in Botany and Zoology (1988) and a B.Sc. (Hons) Zoology degree (1991) from the University of the Orange Free State and has earned her M. Sc. *Cum laude* (Zoology) in 2009 from University of the Free State. Ms. Butler is currently registered as a PhD fellow at the Zoology Department of the UFS, working on her dissertation titled: *A new gorgonopsian from the uppermost Daptocephalus Assemblage Zone, in the Karoo Basin of South Africa.* Ms. Butler is currently employed at the National Museum, Bloemfontein, where she has held the position of Principal Research Assistant and Collection Manager since 1998. She is a registered member of the Palaeontological Society of South Africa (PSSA).

## JAN ENGELBRECHT

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 and 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 Mier local municipality in the Kgalagadi region. He had a significant military career as an officer, where after he qualified as an Animal Health Technician at Technikon RSA and UNISA. He is currently studying for his MA Degree in Archaeology.

## HEIDI FIVAZ

Archaeologist

Heidi Fivaz has been a part of UBIQUE Heritage Consultants since 2016 and is responsible for research and report compilation. She holds a B.Tech. Fine Arts degree (2000) from Tshwane University of Technology, a BA Culture and Arts Historical Studies degree (2012) from UNISA and received her BA (Hons) Archaeology in 2015 (UNISA). She has received extensive training in object conservation from the South African Institute of Object Conservation and specialises in glass and ceramic conservation. Ms. Fivaz is currently completing her MA Archaeology at the University of South Africa (UNISA). She is a professional member of the Association of South African Archaeologists and has worked on numerous archaeological excavation and surveying projects over the past 10 years.