Desktop Heritage Impact Assessment Report

Desktop Heritage Impact Assessment Report for the Prospecting Rights Application: on the Farm Stompoor 109 near Prieska in the Northern Cape Province.

Prepared By:

Prepared For:

Alidabix Pty (Ltd)

CREDIT SHEET

Project Director

STEPHAN GAIGHER (BA Hons, Archaeology, UP)
Principal Investigator for G&A Heritage
Member of ASAPA (Site Director Status)
Tel: (015) 516 1561
Cell: 073 752 6583
E-mail: stephan@gaheritage.co.za
Website: www.gaheritage.co.za

Report Author

STEPHAN GAIGHER

Disclaimer; Although all possible care is taken to identify all 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 study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

Statement of Independence
As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

SIGNED OFF BY: STEPHAN GAIGHER

MANAGEMENT SUMMARY

Site name and location: Desktop Heritage Impact Assessment Report for the Prospecting Rights Application Core and Percussion Boreholes: on the Farm Stompoor 109 near Prieska in the Prieska District of the Northern Cape Province.

Municipal Area: Siyathemba District Municipality

Developer: Alidabix Pty. (Ltd.)

Consultant: G&A Heritage, P.O. Box 522, Louis Trichardt, 0920, South Africa.
38A Vorster St, Louis Trichardt, 0920

Date of Report: 20 September 2018

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This desktop study focuses on the Prospecting Rights Application: on the farm Portion 3 (a Portion of Portion 1 - Stompoor A) of the farm Stompoor 109 ("Stompoor 109") near Prieska in the Prieska District of the Northern Cape Province.

This study encompasses the desktop heritage impact investigation and does not include any fieldwork assessments. A preliminary layout has been supplied to lead this phase of this study.

The study focusses on the proposed borehole footprints which are expected to not exceed 5m x 5m. In fact the actual pressure drill holes will be 16,5cm in diameter and the core drill holes will be less than 10cm in diameter. Access will be through a truck-mounted rig and pulled drilling sled rigs and therefore no access roads will be constructed. Final borehole locations will only be finalised after initial non-invasive prospecting activities.

Scope of Work

A Desktop Heritage Impact Assessment (including Archaeological, Cultural heritage, Built Heritage and Palaeontological Assessment) to determine the possible impacts on heritage resources within the study area posed by the proposed boreholes.

The following are the required to perform the assessment:

- A desk-top investigation of the area;
- Identify possible archaeological, cultural, historic, built and palaeontological sites within the proposed development area;
- Evaluate the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural, historical, built and palaeontological importance.

The purpose of this study is to determine the possible occurrence of sites with cultural heritage significance within the study area (borehole footprints). The study is based on archival and document studies combined with fieldwork investigations.

Findings

The affected area impacted by the borehole footprints were found to be of very limited size compare to the prospecting area as a whole. Due to the fact that the exact location of the boreholes

has not yet been identified it is difficult to determine if any surface sites will be affected. A document study of the proposed prospecting area (Stompoor) indicated significant paleontological importance in the area.

Recommendations

It is recommended that once the specific borehole sites have been determined after initial non-invasive prospecting activities, that these be subjected to a surface investigation to determine if any sites of heritage significance will be affected. Due to the high paleontological value of the area it is suggested that a paleontological study lead the placement of the boreholes to minimize their impact. It is also possible to use the prospecting boreholes to further paleontological research into the known deposits and this should be further investigated.

Fatal Flaws

No fatal flaws were identified.

TABLE OF CONTENTS

List of Figures

List of Abbreviations

Bp ..... Before Present

EIA ..... Early Iron Age

ESA ..... Early Stone Age

Fm ..... Femtometre (10^{-15}m)

GPS ..... Geographic Positioning System

HIA ..... Heritage Impact Assessment

I&AP ..... Interested and Affected Parties

LIA ..... Late Iron Age

LSA ..... Late Stone Age

MYA ..... Million Years Ago

MSA ..... Middle Stone Age

NHRA ..... National Heritage Resources Act no 22 of 1999

SAHRA ..... South African Heritage Resource Agency

S&EIR ..... Scoping & Environmental Impact Reporting

Um ..... Micrometre (10^{-6} m)

WGS 84 ..... World Geodetic System for 1984

Chapter 1

PROJECT RESOURCES

DESKTOP HERITAGE IMPACT REPORT

DESKTOP HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROSPECTING RIGHTS APPLICATION ON THE FARM STOMPOOR 109 NEAR PRIESKA IN THE NORTHERN CAPE PROVINCE.

1. INTRODUCTION

1.1 LEGISLATION AND METHODOLOGY

G&A Heritage was appointed by *Alidabix (Pty) Ltd.* to undertake a desktop heritage impact assessment for the Prospecting Rights Application on the Farm Stompoor 109 near Prieska in the Prieska District of the Northern Cape Province.

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

(a) Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
(b) Construction of a bridge or similar structure exceeding 50 m in length; and
(c) Any development, or other activity which will change the character of an area of land, or water –
(1) Exceeding 5 000 m^2 in extent;
(2) Involving three or more existing erven or subdivisions thereof; or
(3) Involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or
(d) The costs of which will exceed a sum set in terms of regulations; or
(e) Any other category of development provided for in regulations.

While the above describes the parameters of developments that fall under this Act., Section 38 (8) of the NHRA is applicable to this development. This section states that;

> (8) The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

In regards to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

> (3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:
> (a) The identification and mapping of all heritage resources in the area affected;

(b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;
(c) An assessment of the impact of the development on such heritage resources;
(d) 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;
(e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
(f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
(g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

(1) Ancestral graves,
(2) Royal graves and graves of traditional leaders,
(3) Graves of victims of conflict (iv) graves of important individuals,
(4) Historical graves and cemeteries older than 60 years, and
(5) Other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);

(h) Movable objects, including ;

(1) Objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
(2) Ethnographic art and objects;
(3) Military objects;
(4) Objects of decorative art;
(5) Objects of fine art;
(6) Objects of scientific or technological interest;
(7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
(8) Any other prescribed categories, but excluding any object made by a living person;

(i) Battlefields;
(j) Traditional building techniques.

A '**place**' is defined as:

(a) A site, area or region;
(b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
(c) 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); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'**Structures**' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'Archaeological' means:

(a) 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;
(b) Rock art, being a 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 including any area within 10 m of such representation; and
(c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;

(d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Field investigations were performed on foot and by vehicle where access was readily available.
- Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by *Alidabix (Pty) Ltd.* is accurate.
- We assumed that the public participation process performed as part of the Basic Assessment process was sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	Yes	Mitigation and chance finds protocol
	36	Graves and burial sites	No Impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	No	N/A
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m^2	Yes	Prospecting Rights Application: Stompoor 109
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A

Re-zoning of site exceeding 10 000 m^2	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

2. Background Information

2.1 Prospecting Rights Application

2.1.1 Project Description

Alidabix (Pty) Ltd has applied for a Prospecting Right for Copper, Zinc, Lead, Gold, Silver, Diamonds, Sulphur, Pyrite, Molybdenum, Iron, Niobium, Phosphate, Salt, Rare Earths and Zirconium on the Farm Stompoor 109 near Prieska in the Prieska District of the Northern Cape Province which application was accepted by the Department of Mineral Resources.

Prospecting activities are planned to be conducted in phases over a period of five years.

Description of planned non-invasive activities:
(These activities do not disturb the land where prospecting will take place e.g. aerial photography, desktop studies, aeromagnetic surveys, etc.)

Phase 1:
In order to direct the exploration program in an efficient manner, there will be a review of all available information and data gathered by previous exploration on the farm. A desktop study will be undertaken of the base metal potential of the area. A site investigation of the target areas will be undertaken to identify infrastructure and determine any potential problems that may need to be addressed.

Phase 2:
Any anomalous features identified will be mapped in detail. The various rock types and their contacts will also be mapped.

Phase 3:
A 3 line kilometer magnetic survey (or any other suitable geophysical method) will be undertaken using a proton 5 magnetometer over selected areas as identified during the desktop study. This study will result in identifying potential base metal / sulphide mineralization.

Phases 5, 7 & 9:
Drill samples will be collected in one-meter intervals and logging will be done by a qualified geologist who will record the lithology, mineralogy, degree of mineralization and structural features. Mineralized samples will be analyzed at an internationally recognized (ISO certified) laboratory.

Phase 10:
A detailed feasibility report, containing resource calculations, will be compiled after drilling operations have been completed to evaluate the economic viability of the project.

Description of Planned Invasive Activities:
(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.)

Phase 4: Percussion drilling
Percussion drilling will be used initially to identify the position of a suspected base metal deposit. The position of the boreholes is dependent on the results of the review of historical activities, geological mapping, desktop study and geophysical survey.

Forty boreholes, on average 50m deep each, are planned. The collar position of all boreholes will be surveyed. All drilling will be short term and undertaken by a contractor using truck-mounted equipment.

Angled percussion holes are planned to locate and intersect the mineralization. A traverse line or grid drilling is used to identify and define the extent of any mineralization. The sizes of the boreholes drilled will be determined by such factors as cost, proposed sampling, availability of drilling machines and the volume of sample required, among others.

Each drill site will be rehabilitated. The boreholes will be filled with drill chips and covered with topsoil.

Phases 6 & 8: Core drilling
Depending on the results from the non-invasive prospecting activities as well as the percussion drilling phase, further confirmation and exploratory drilling may be required. Core drilling will only be used if mineralization has been found. The position of the boreholes is dependent on the results of the non-invasive activities.

Ten boreholes, on average 75m deep, are planned for phase 6, but depending on results this could be more. The collar position of all boreholes will be surveyed.

Each drill site will be rehabilitated before a new site is established. The boreholes will be covered with a metal plate and 0.2m previously stored topsoil.

2.1.2 Site Description

A temporary site shall be established at each drill site consisting of the following:

- Drill rig.
- Water tank for domestic use.
- Chemical toilets.

Each drill site shall be rehabilitated before a new site is established and the borehole drilled.

2.1.3 Public Participation

The surface owners and other interested and affected parties of the proposed prospecting activities to be undertaken by Alidabix have been informed to ensure that the rights and needs of all parties are considered.

Registering as an I&AP will ensure that you are placed on a database of persons to be informed of any progress regarding the proposed activity. Copies of all relevant documentation will be made available to registered I&AP's.

2.1.4 Site Location

The Application Areas are situated 90km west of the small town of Prieska in the Northern Cape Province.

Figure 1. Locality of the of the Farm Stompoor 109 in relation to Prieska

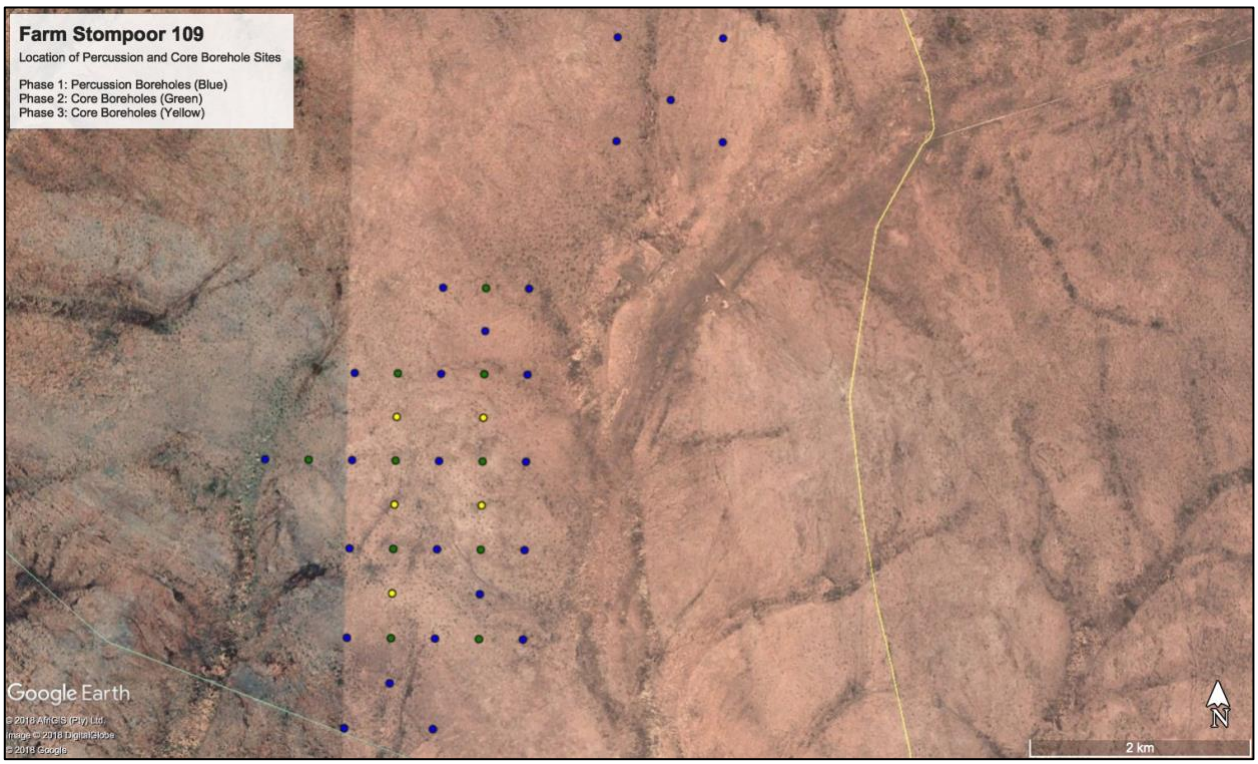

Figure 2. Location Map, Stompoor 109 indicating possible Percussion and Core- Boreholes positions

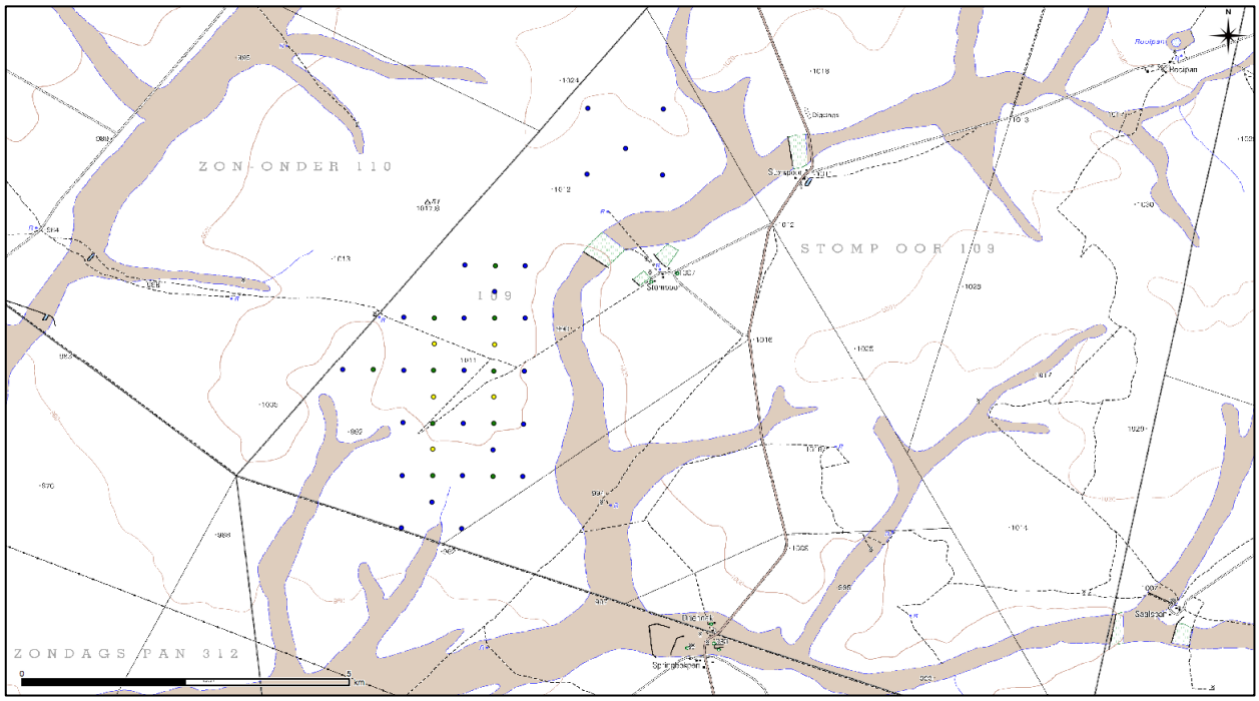

Figure 3. Topographical Map 2921 DD 2005

2.1.5 Alternatives Considered

None.

Chapter 2

METHODOLOGY

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

3. REGIONAL CULTURAL CONTEXT

3.1 PALAEONTOLOGY

TABLE 1: FOSSIL HERITAGE IN THE COPPERTON AREA

GEOLOGICAL UNIT	ROCK TYPES & AGE	FOSSIL HERITAGE	PALAEONT-OLOGICAL SENSITIVITY	RECOMMENDED MITIGATION
Gordonia Formation KALAHARI GROUP	mainly aeolian sands *plus* minor fluvial gravels, freshwater pan deposits PLEISTOCENE	calcretised rhizoliths & termitaria, ostrich egg shells, land snail shells, rare mammalian and reptile(*e.g.* tortoise) bones, teeth freshwater units associated with diatoms, molluscs, stromatolites *etc*	LOW	none recommended any substantial fossil finds to be reported by ECO to SAHRA
Mbizane Formation DWYKA GROUP	tillites, interglacial mudrocks, deltaic & turbiditic sandstones, minor thin limestones LATE CARBONIFER-OUS – EARLY PERMIAN	sparse petrified wood & other plant remains, palynomorphs, trace fossils (*e.g.* arthropod trackways, fish trails, U-burrows) possible stromatolites in limestones	LOW	none recommended any substantial fossil finds to be reported by ECO to SAHRA
Vogelstruis-bult Formation JACOBSMYN PAN GROUP	high grade metamorphic rocks (*e.g.* banded gneisses, migmatites) MID PROTEROZOIC = LATE PRECAMBRIAN	none	ZERO	none recommended
Spioenkop Formation MARYDALE GROUP	metamorphic rocks (*e.g.* quartzites, schists, amphibolites) ARCHEAN = EARLY PRECAMBRIAN	none	ZERO	none recommended

Figure 4. Stone formation table

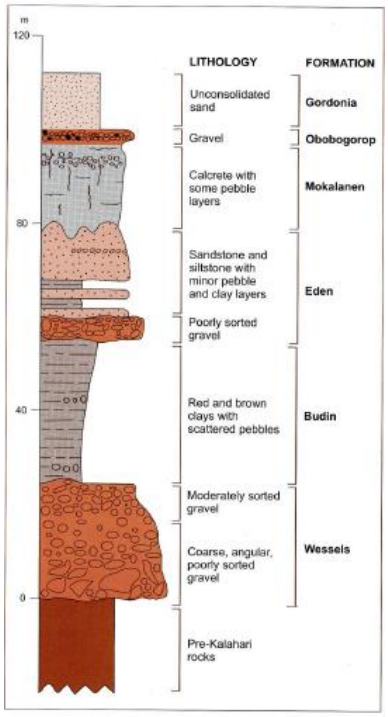

Figure 5. Stratigraphy of the Kalahari Group (from Partridge, 2006)

The Palaeontology Sensitivity Map published by SAHRA on the South African Heritage Resources Information System (SAHRIS) gives guidelines for the management of paleontological sensitive areas.

The study area falls within the green and blue zone.

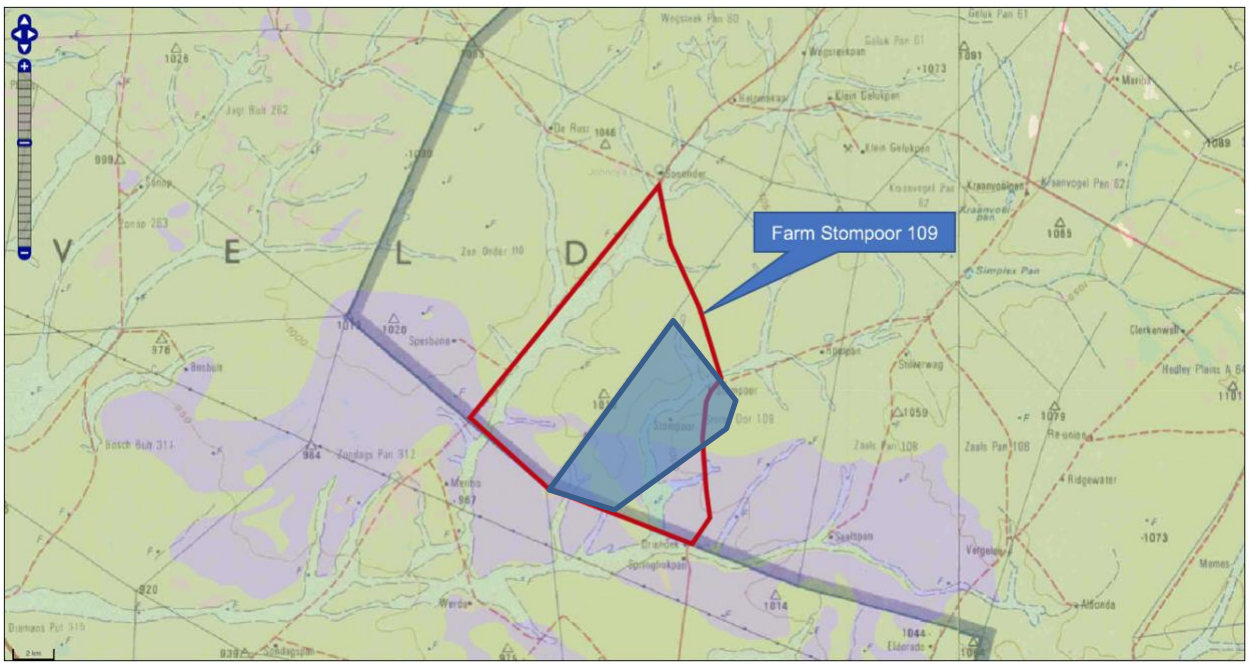

Figure 6. Palaeo Sensitivity Map (study area in opaque blue)

Table 3. Palaeontological Sensitivity

Colour	Sensitivity	Action Required

RED	VERY HIGH	Field assessment and protocol for finds is required.
ORANGE / YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely.
GREEN	MODERATE	Desktop study is required.
BLUE	LOW	No Palaeontological studies are required however, a protocol for finds is required.
GREY	INSIGNIFICANT / ZERO	No Palaeontological studies are required.
WHITE / CLEAR	UNKNOWN	These area will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

A literature study did however reveal that this classification was seriously flawed since significant paleontological finds have been made at the farm Stompoor mainly due to the presence of a Kimberlite volcanic pipe.

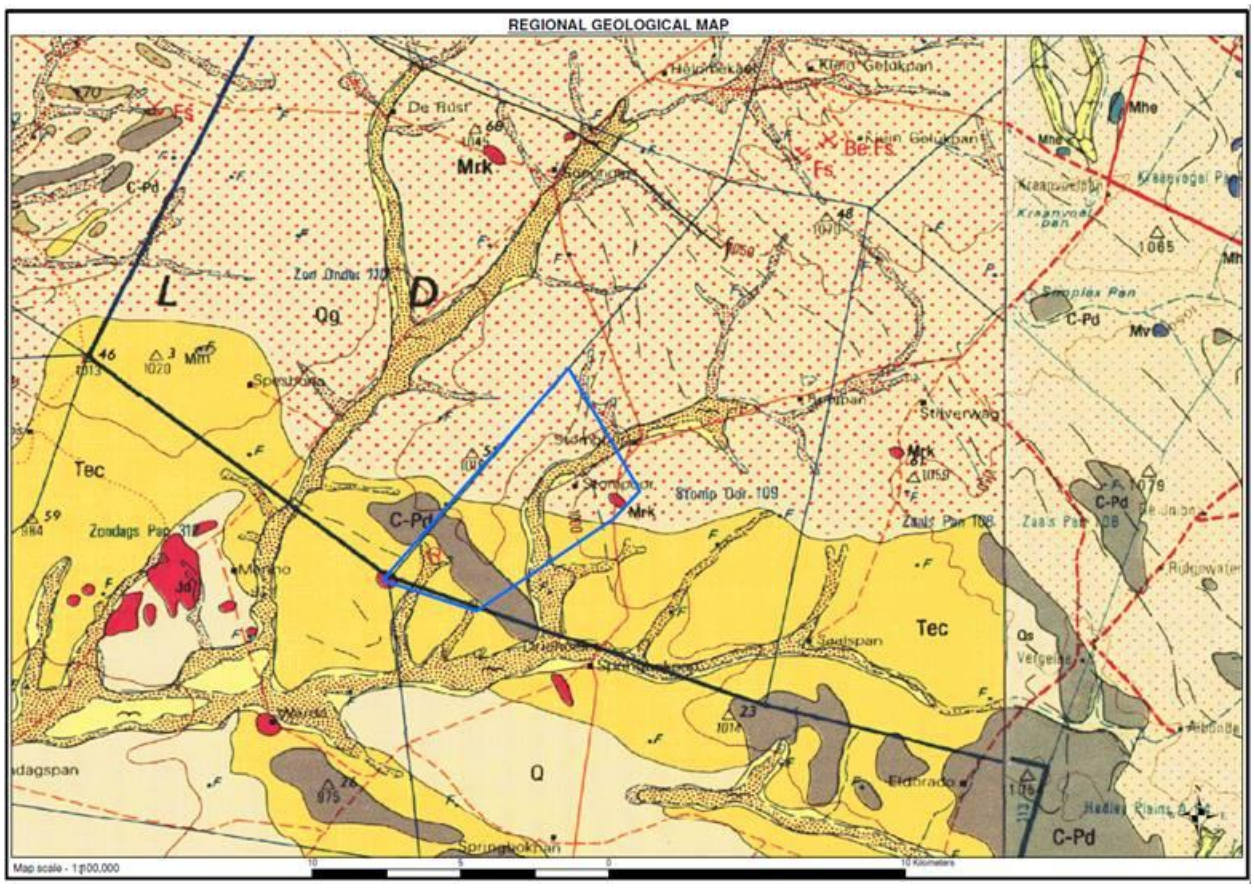

Figure 7. Geological Map of Stompoor

"The Stompoor shaft entered the crater facies 3 m below the surface and penetrated to 11.1 m through a sequence dominated by debris-flow conglomerates (Fig. 3). These represent subaerial landslides that originated from slope failures in the surrounding tuff cone and slid downslope into the lake, ending up spread out over the lakebed. During this short period of subaqueous movement, the debris flow had the ability to entrain organic debris such as fish and frog cadavers and bivalve and ostracod shells that lay on the lakebed.

Between the conglomerate beds, much thinner, discontinuous beds of laminated siltstones with granule layers and claystone drapes yielded abundant, fully articulated frog skeletons, including several larval stages, a few woody plant stems, an araucarian cone, and a string of seven articulated

caudal vertebrae of an ornithopod dinosaur (Ralph Molnaar, pers. comm.). The laminated beds are interpreted as storm-driven turbidites that were deposited during downpours when cool, sediment-laden runoff water entered the stratified lake and traveled as density underflows along the lakebed." (Sturm and Matter, 1978).

"A large diameter borehole core from an epiclastic kimberlite remnant on the farm Stompoor in the Prieska district, Cape Province, contains a continuous 76 m section of fossiliferous sediments interpreted as having accumulated within a crater-lake during the Late Cretaceous. Three distinct facies associations reflect depositional processes that prevailed in offshore areas of the original lake. Facies Association A: matrix supported pebble conglomerates comprising a chaotic assemblage of pyroclastic, basement and country rocks set in a fine-grained matrix. Flat, non-erosional basal surfaces with 'frozen' rip-up clasts, the protrusion of matrix-supported clasts above the upper surfaces and a direct relationship between maximum clast size and bed thickness suggest deposition from debris flows that originated subaerially on pyroclastic talus cones surrounding the crater. Facies Association B : alternating thin beds of matrix-supported granule conglomerate, structureless fine-grained sandstone and parallel laminated mudrock. Small fining-upward sequences within these beds are comparable to turbidite Bouma Tade, Tde. Numerous partings display petrified fish and frog skeletons, as well as bivalve, gastropod and ostracode shells, leaf impressions, insect wings and a possible bird bone.These beds were deposited by thin debris-flows and turbidity underflows interspersed with periods of 'pelagic' sedimentation. Facies Association C: microlaminated mudstone beds containing scattered 'dropstone lapilli'. The lamination is imparted by alternating Ca-rich/Ca-poor layers which may reflect climatic seasonality. They are interpreted as the result of seasonally influenced suspension settling through a thermally stratified water column." (R.M.H. Smith 1986).

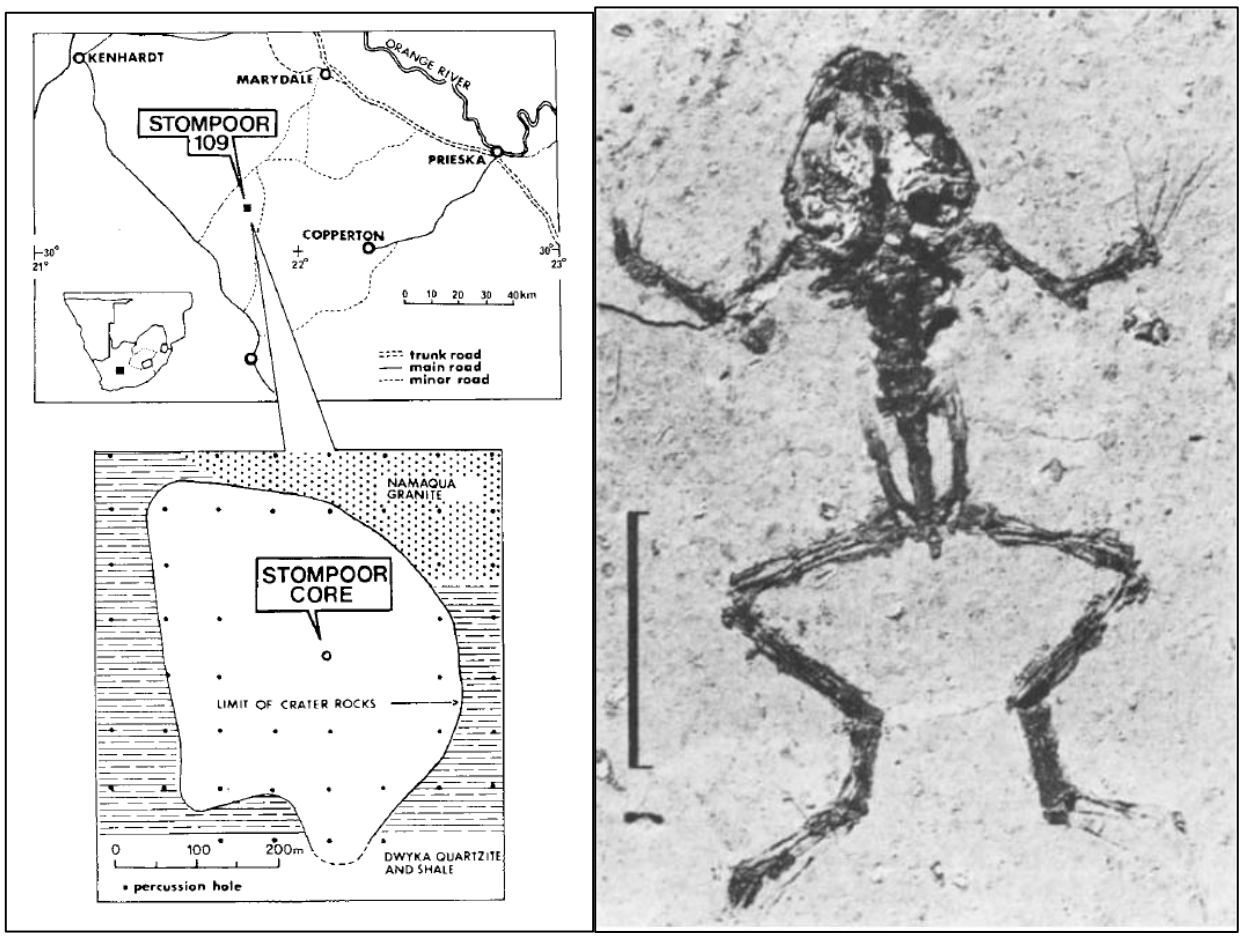

Figure 8. Location of Stompoor, core borehole and frog fossil

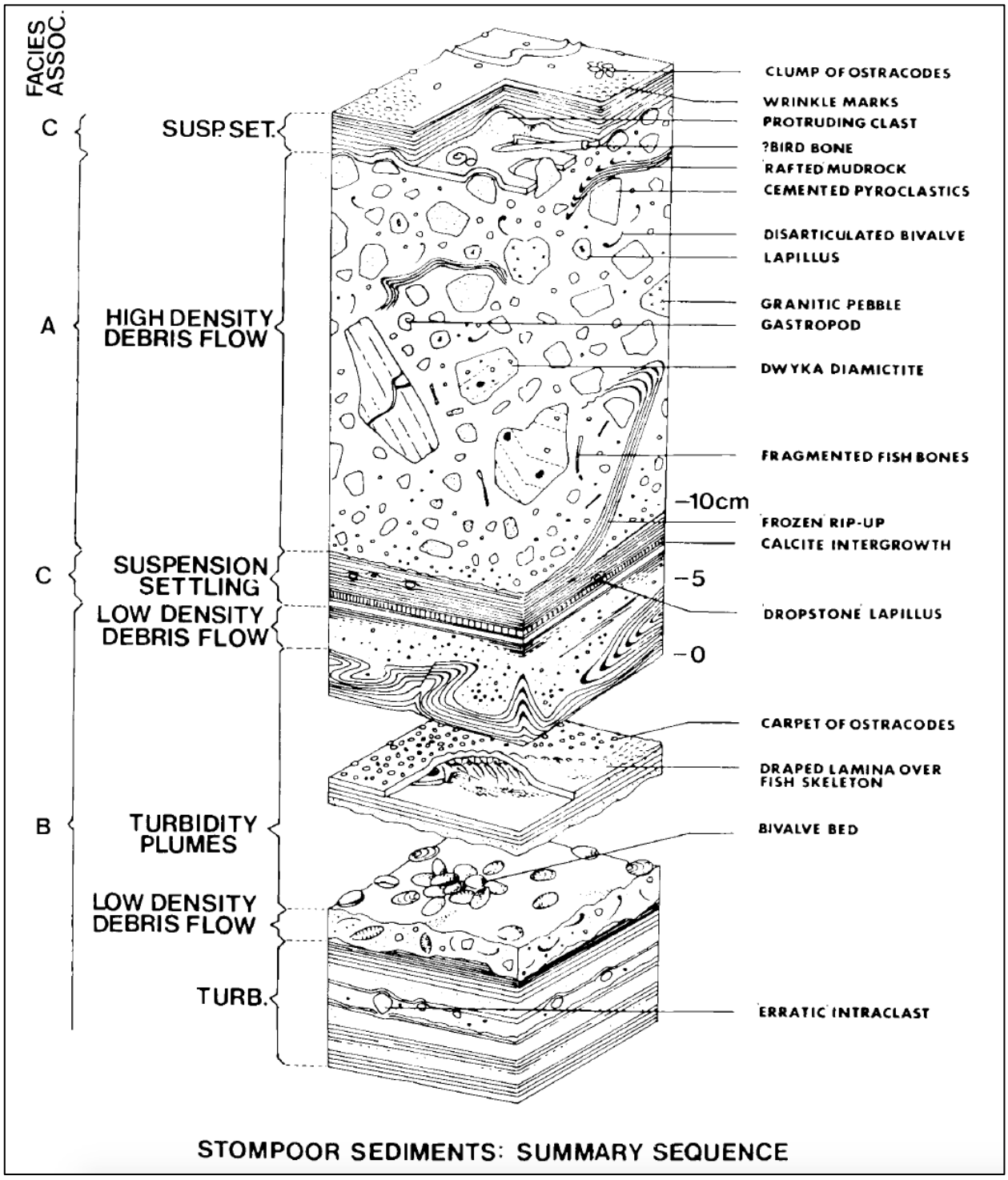

Figure 9. Summary Sequence of Stompoor Crater-Lake Lithofacies Associations (Smith, 1986)

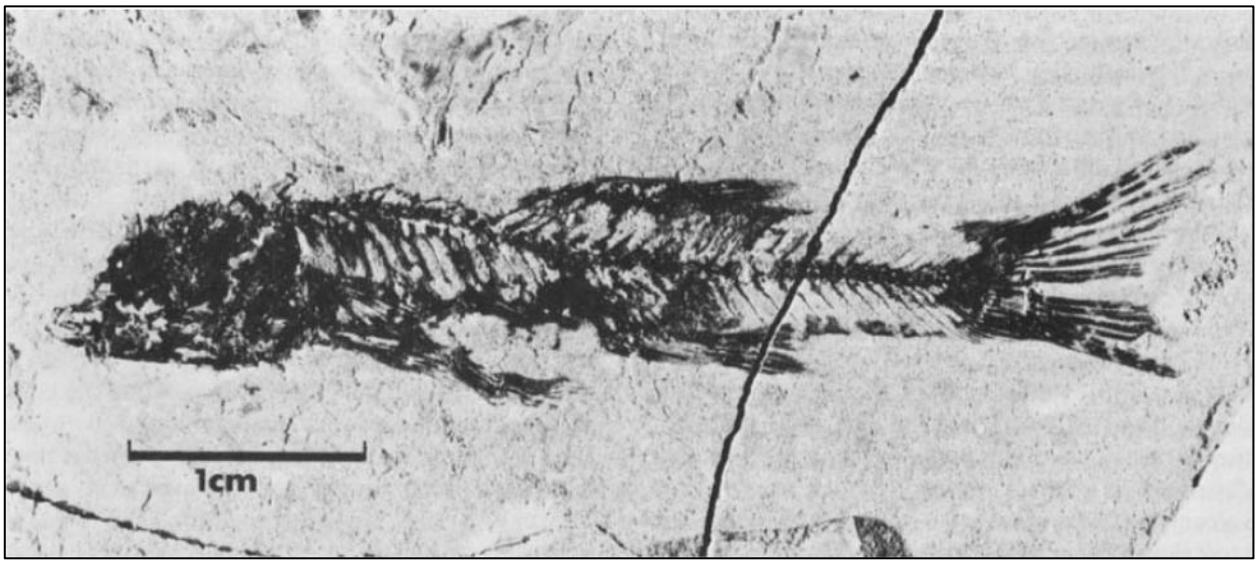

Figure 10. Fossil Teleost Fish (Smith 1986)

"Fish, frogs, ostracodes, bivalves and gastropods were preserved in the bottom sediments of the centralportion of the crater lake. With the possible exception of the fish most of the aquatic and benthic fauna would have lived along the margins of the lake and their remains transported, after death, into the central areas by sediment gravity flows. Scant remains of a Cretaceous crater-lake deposits 385 winged insect, and a possible bird bone, are evidence of their former presence around the ancient crater lake. Vegetation was probably confined to the lake margin and larger gulleys. Fossil wood and a maplelikel eaf impression suggest colonization by deciduous trees." (Smith, 1986)

3.2 Stone Age

This area is home to all three of the known phases of the Stone Age, namely: The Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known (Clark 1959).

Archaeological and heritages studies in the Northern Cape indicate that the area is of high Stone Age archaeological and heritage significance. It is in fact a cultural landscape where Stone Age, Iron Age and Historical period sites contribute the bulk of the cultural heritage of the region (also see Hart, 2005; Kaplan, 2010; Kiberd, 2006; Morris, 1990; Orton, 2011). A study conducted by Schalkwyk (2011) for the establishment of a mainstream renewable solar power in Prieska region revealed that most sites in this region belong to the Stone Age that are the Early Stone Age (ESA), Middle Stone Age (MSA) and Late Stone (LSA). Similar observations were made by Morris (2000). Kiberd (2001, 2006) who also excavated Budu Pan 25 -30 km northwest of Prieskawhere ha profile ESA, MSA and LSA deposits was recorded. Several LSA sites in the northwest and south of the Prieska region were also investigated by Beaumont et al., (1995), Smith (1995a), and Parsons (2003, 2004, 2007). Rock engraving sites are also found in the Prieska region. Kuil and Driekopseiland are some of the rock engraving sites in the region (Beaumont et al., 1995, Beaumont and Vogel 1989, Rudner and Rudner 1968, Rush and Parkington 2010, Wilman 1933). Orton (2012) found scrapped engravings between Prieska and Vanwyksvlei. Stone circles belonging to the LSA were also recorded further along the Orange River by Orton (2012) in addition to what Sampson (1968) had earlier recorded. Cave sites also exist in the landscape eastern Northern Cape regions with MSA deposits. A British fort at Prieska is one of the heritage sites that is ruminant of the late 19-century Anglo-Boer war. In addition, there are also war graves in the region (also see Southerncape 2010, Orton 2012). A study conducted by Orton (2012) revealed also historical sites in Klipgat Pan.

SOURCE: Archaeological and Heritage Impact Assessment Report for the Proposed 75 MWP Photovoltaic Power Plant and its Associated Infrastructure on a Portion of the Remaining Extent of Erf 1 Prieska, Northern Cape – "ABC Prieska Solar 1 Project"

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003).

The survey found that Stone Age archaeological material was present throughout the study area. The vast majority of it was considered to be background scatter, the "low density lithic scatter" of Beaumont et el. (1995:240).

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods (Deacon 1984). This enabled skilled hunter-gatherer bands to adapt to different environments.
From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

Specifically, the Wonderwerk Cave in the Kururman hills has provided much Stone Age information (Beaumonth 1984, 2006).

Specularite mining is noted by Beaumont and Bashier (1974) at Doornfontein and Blinkklipkop between 800AD – 820AD.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

3.3 Iron Age

Although there is documentary evidence of a large Iron Age Tswana village – Dithakong, located in the general area the occurrence of this is still hotly contested and the findings of Cobbing have been largely discredited (Cobbing 1988, SAHRA ARC pers. comm).

More recent research by Jacobs shows occupational Tswana sites to occur during the later "Bantu Expansion" and "Proto-Difiqane between c1750 and 1830 in the study area. Specifically the Tlhaping and Tlharo chiefdoms are referred to here (N. J. Jacobs, 199). It is even suggested that some Sotho-Tswana people might have preceded the Tlhaping and Tlharo in this region. This is however not a recent postulations since Ellenberger and MacGregor already proposed earlier Iron Age communities in these areas as early as 1912 (Ellenberger & MacGregor, 1912).

Tswana Industry groups might have continued the specularite mining noted in the Stone Age during the Iron Age in this area from 1600 on.

According to Breutz (1963) Iron Age settlements could be found as far south as Gatlhose and Majeng, which are both within 25km of the study area. Such sites have also been identified at Danielskuil (Snyman, 1986). These groups were eventually driven from the area by the Kora (Snyman, 1986).

3.4 The Historic Era

The study area was settled by white farmers late in South Africa's history. Very little of the region's recent history is recorded. Neither the Genealogical Society not the Monuments Database at Google Earth have any recorded sites in the study area.

Copper and Zinc was discovered in the region in 1968 and the Prieska Copper Mines, owned by Anglovaal Mining Ltd. was established. It became of the South Africa's major base-metal mines, one of the first to have a decline from the surface, using trackless mining methods.

Prieska saw its heyday between 1970 and the end of the 20th century when the town housed mine workers and their families. The copper and zinc mine which opened in 1972 was shut down down by the Anglovaal Mining Group in 1991. Most of the buildings were demolished and only a few houses are presently used by Armscor, who operate the weapons testing center at Alkantspan. Their primary purpose was initially to test artillery, rockets, short range missiles, mortars and anti-aircraft weapons for the then SA Defense Force. Present day, the Alkantspan Test Range has become a major asset for its owners. It is today not only used by the SA National Defence Force (SANDF) but finds itself hosting foreign militaries as well as foreign munitions manufacturers.

Sources:

- http://www.defenceweb.co.za/index.pHP?option=com_content&view=article&id=36798
- http://www.sahra.org.za/sahris/sites/default/files/otherrefsdecisions/1-DSR%20Hoekplaas%20PV2-11_0.pdf
- http://www.nersa.org.za/Admin/Document/Editor/file/Consultations/Electricity/Presentations/Mulilo%20Renewable%20Energy%20Solar%20PV%20Prieska.pdf
- Van Der Walt, J. 2013. Archaeological Impact Assessment Report for the Garob to Kronos Power Line, near Prieska in the Northern Cape.
- Orton, J. 2015. Heritage Impact Assessment for three Proposed Solar Energy Facilities and three Associated Transmission Lines near Prieska, Prieska Magisterial District, Northern Cape.

3.5 Cultural Landscape

Most of the areas investigated is being used for small livestock farming. Small farm homesteads and associated outbuildings as well as farming structures such as water troughs and livestock enclosures abound in the area.

3.6 Archival Research

Three main sources of information regarding the heritage sensitivity of this area could be identified. These were;

- Scientific publications on heritage related research in the area
- Previous heritage studies in the area as per the SAHRIS database
- Historic maps and figures as available in the National Archive

3.6.1 Scientific publications

Several publications on heritage related work in this area could be sourced. These include, but are not limited to;

- Beaumont, P.B. and Boshier A.K. (1974). *Report on Test Excavations in a Prehistoric Pigment Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol.29, No 113/114 (Jun., 1974), pp. 41 – 59.
- Humphreys, A.J.B. *Note on the Southern Limits of Iron Age Settlement in the Northern Cape*. The South African Archaeological Bulletin, Vol 31, No. 121/122 (jun., 1976), pp. 54-57.
- Thackeray, A.I., Thackeray J.F., Beaumont, P.B. *Excavations at the Blinkklikop Specularite Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol. 38, No. 137 (Jun., 1983), pp. 17-25.
- Forssman, T.R., Kuman, K, Leader, G.M., Gibbon, R.J. *A Later Stone Age Assemblage from Canteen Kopje, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 204-214.
- Couzens, R., Sadr, K. *Rippled Ware at Blinklipkop, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 196 – 203.
- Rudner, J., Rudner, I. *Rock-Art in the Thirstland Areas*. The South African Archaeological Bulletin, Vol.23, No. 91 (Dec., 1968), pp. 75-89.

- Humphreys, A.J.B., *Cultural Material from Burials on the Farm St. Cair, Douglas Area, Northern Cape*. The South African Archaeological Bulletin, Vol 37, No. 136 (Dec., 1982), pp. 68-70.

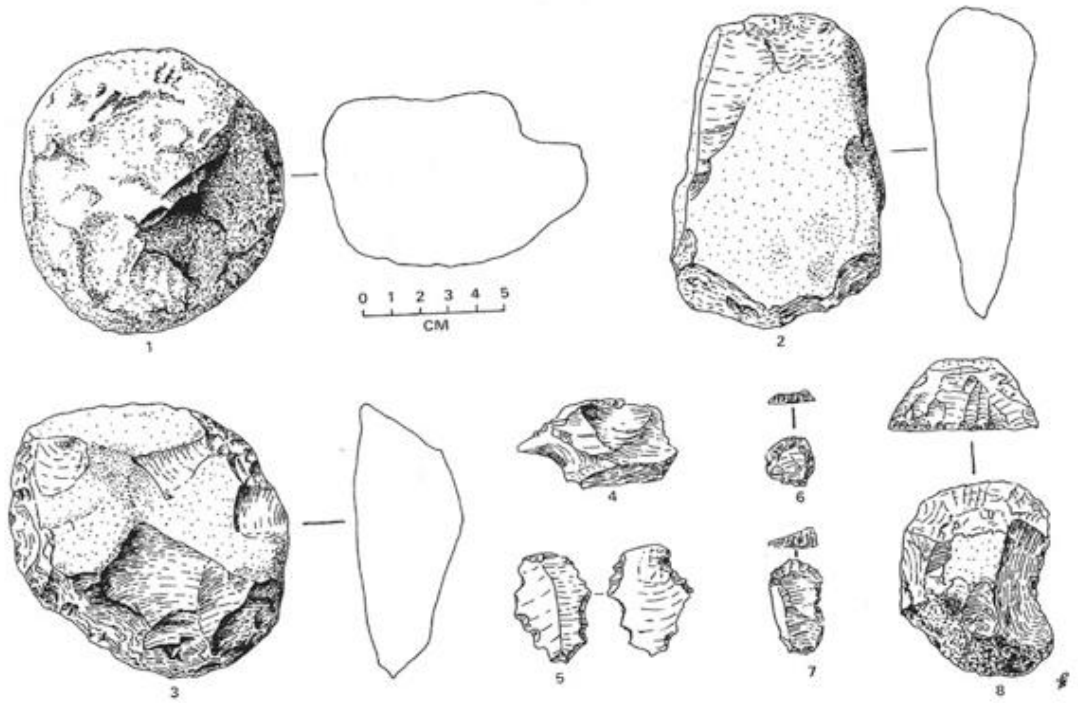

Figure 11. Stone tools

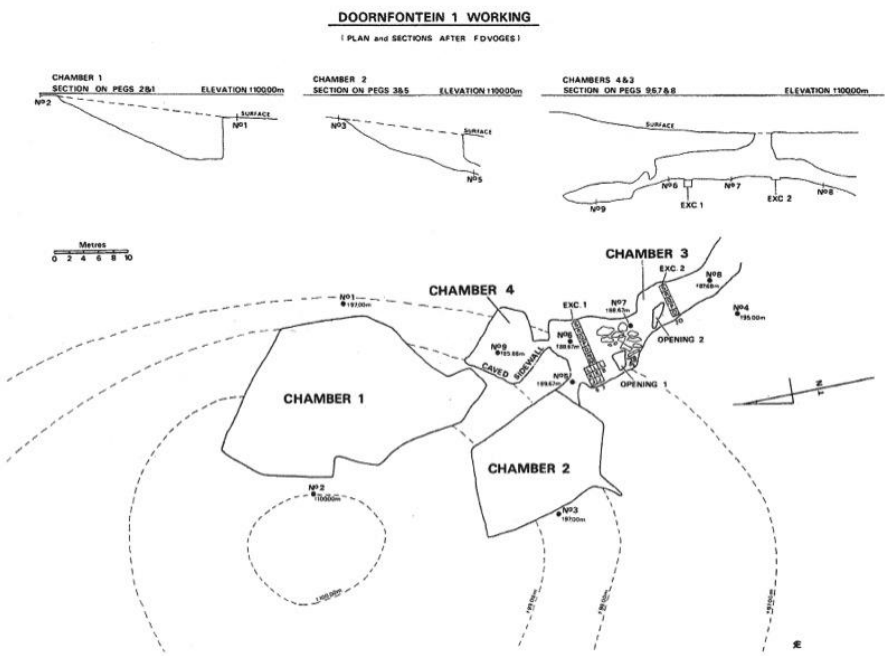

Figure 12. Stone Tools and Layout figure for Doornfontein (Beaumont & Boshier, 1974)

- The identification of petroglyphs of elephant, kudu, ostrich, etc. on the farm Beeshoek. Some geometric symbols similar to *Late Red Art* is also identified here by Judner in 1968 (Judner & Judner, 1969).
- Petroglyphs are also identified at Koegrabie on the farm Eindgoed (Rudner & Rudner, 1968).

3.6.2 SAHRIS Database Studies

An extensive research into the SAHRIS database resulted in the identification of the following heritage related studies that have been performed over the last decade in the study area. Only studies within a radius of 50km from the study area were considered.

- Lavin, J., Bluff, K. 2016. Heritage Screener: CTS16_056 ACRM WEF Access Road Prieska
- Kaplan, J., Wiltshire, N. 2011. Archaeological Impact Assessment of Proposed Wind Energy Facility, Power Line and Landing Strip in Prieska, Siyathemba Municipality, Northern Cape.
- Kaplan, J. 2010. Archaeological Scoping Study and Impact Assessment of a Proposed Photovoltaic Power Generation Facility in Prieska Northern Cape.
- Attwell, M. Heritage Assessment Proposed Wind Energy Facility and Related Infrastructure, Struisbult Farm 103, Portions 4 and 7, Prieska, Prieska.
- Almond, J.E. 2011. PIA Desktop Study: Proposed Plan 8 Wind Energy Facility Near Prieska, Northern Cape Province.
- Almond, J.E. 2011. Palaeontological Impact Assessment: Desktop Study – Proposed 100MW Concentrating Solar Power (CSP) Generation Facility: Prieska, Northern Cape.
- Orton, J. 2013. Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on Farm Hoekplaas 146, Prieska, Northern Cape.
- Orton, J. 2015. Heritage Impact Assessment for four Proposed Borrow Pits on Remainder of Farm Vogelstruisbult 104/1, Prieska Magisterial District, Northern Cape.
- Orton, J. 2014. Archaeological Mitigation of Later Stone Age Sites on the Remainder of Portions 4 of Klipgats Pan 117, Prieska Magisterial District, Northern Cape.
- Van Der Walt, J. 2013. Archaeological Impact Assessment for the Proposed Bosjesmansberg PV Center Solar Energy Facility, located close to Prieska in the Northern Cape.
- Orton, J. 2012. Heritage Impact Assessment for a Proposed Photovoltaic Energy Plant on the Farm Hoekplaas near Prieska, Northern Cape.
- Almond, J.E., Smuts, K. 2012. Palaeontological Specialist Assessment: Desktop Study Proposed Photovoltaic Energy Plant on Farm Hoekplaas (Remainder of Farm 146) near Prieska, Northern Cape Province.
- Orton, J. 2012. Heritage Impact Assessment for a Proposed Photovoltaic Energy Plant on the Farm Vogelstruisbult near Prieska, Northern Cape.
- Van Der Walt, J. 2012. Archaeological Impact Assessment Report for the Proposed Garob Wind Energy Facility Project, located close to Prieska in the Northern Cape.
- Almond, J.E. 2012. Palaeontological Desktop Study for the Proposed Photovoltaic Energy Plant on the Farm Struisbult (Portion 1 of Farm 104) near Prieska, Northern Cape.
- Orton, J. 2916. Heritage Impact Assessment for a Proposed Photovoltaic Energy Plant on The Farm Klipgats Pan Near Prieska, Northern Cape.
- Van Der Walt, J. 2013. Archaeological Impact Assessment Report for the Garob to Kronos Power Line, near Prieska in the Northern Cape Province.
- Orton, J. 2015. Heritage Impact Assessment for three Proposed Solar Energy Facilities and three Associated Transmission Lines near Prieska, Prieska Magisterial District, Northern Cape.
- Almond, J.E. 2015. Environmental Impact Assessment Process: Proposed 75 Megawatt Kronos Photovoltaic Facilities 1 – 3 and Associated Transmission Lines 1 – 3 near Prieska, Northern Cape.
- Webley, L. 2014. Archaeological Impact Assessment: Proposed Construction of Humansrus PV 2 Grid Connection (associated with the Humansrus PV Energy Facility, previously named RE Capital 14 Solar Development) on the Remainder of the Farm Humansrus 147 near Prieska, Northern Cape.
- Fourie, W. 2015. Three 75MW Solar Photovoltaic (PV) Energy Facilities – Helena Projects.

3.6.3 Historic Maps

Especially during the evaluation of historic structures, the use of archived historic maps is very handy. They give a direct chronological reference for such sites and also lead the investigation on the ground.

The following historic map sets are relevant for this study (in chronological order);

- 2921 DD Topographic Sheet, First Edition Cadastral Survey (1970, 1988 & 2003)

2921 DD 1970 Stompoor 109

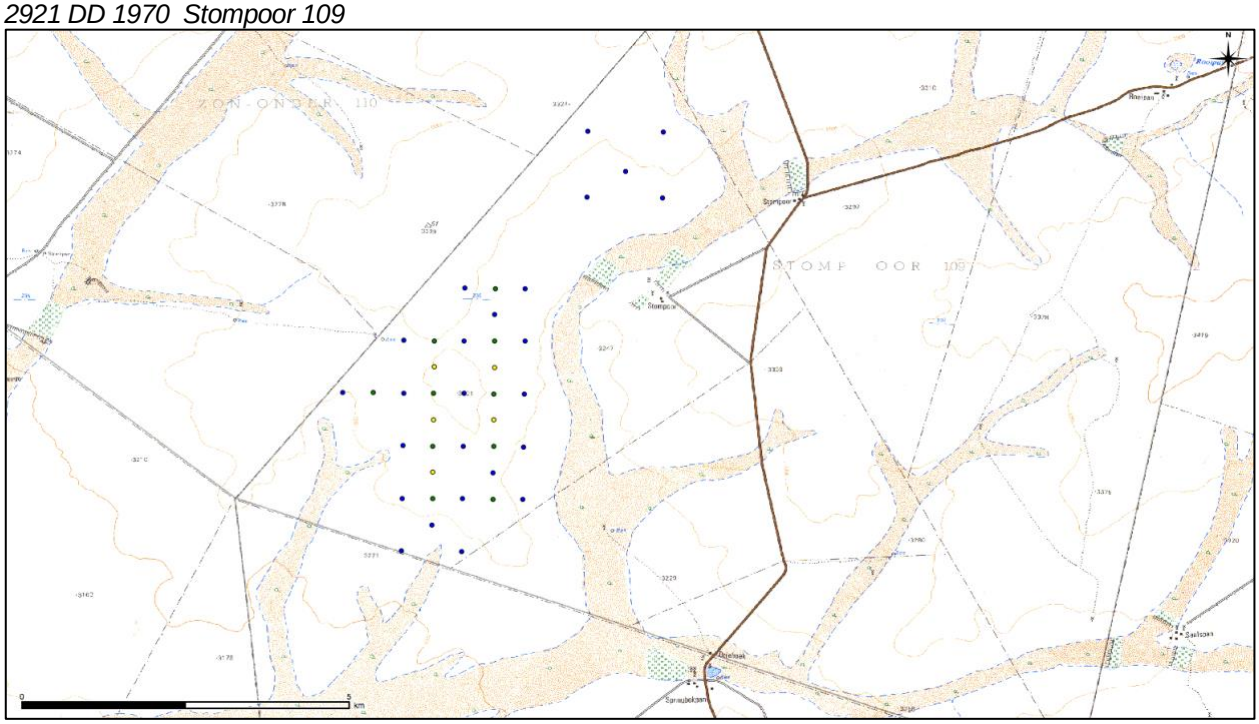

Figure 13. 2921 DD (1970)

2921 DD 1988 Stompoor 109

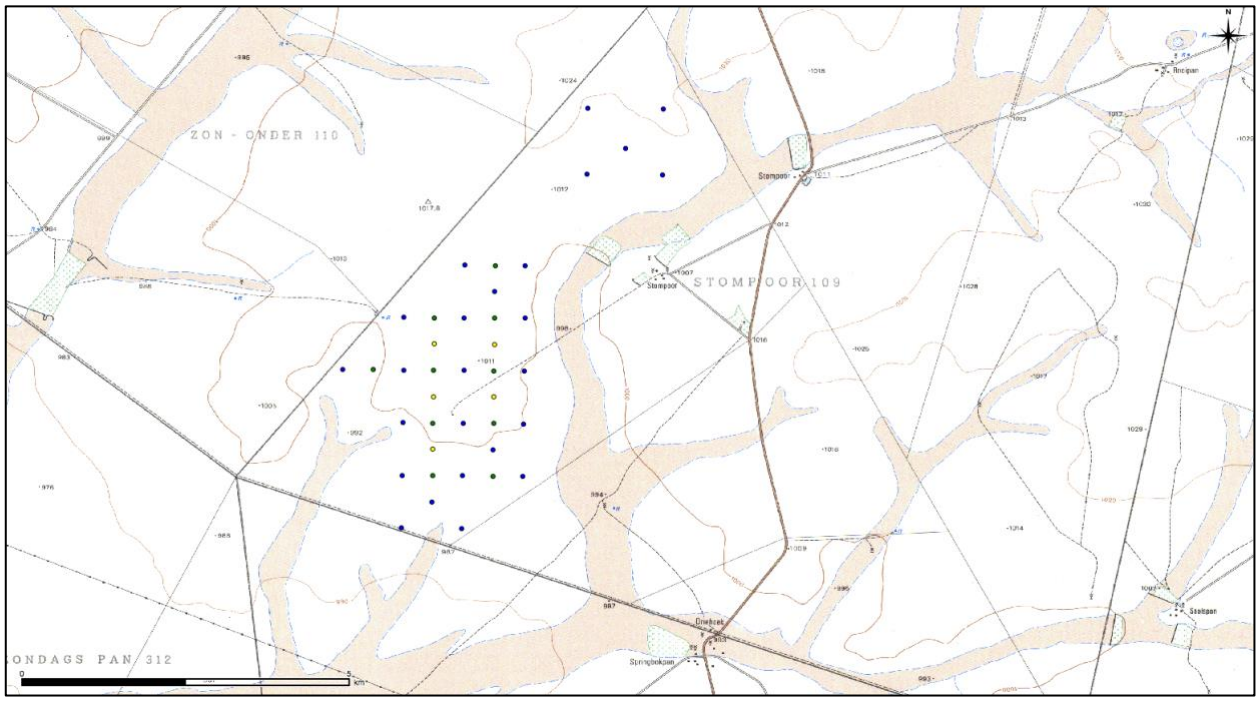

Figure 14. 2229 DD (1988)

2921 DD 2003 Stompoor 109

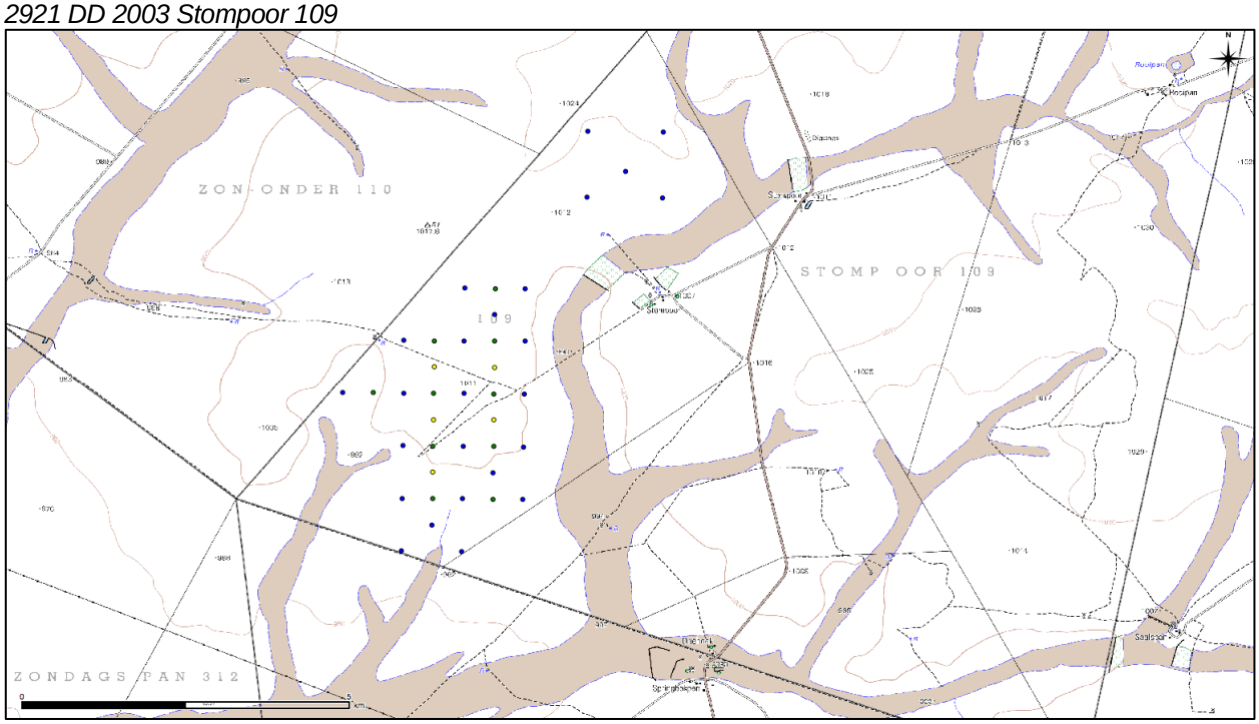

Figure 15. 2921 DD 2003

None of the historic maps shows any developments of any heritage significance.

4. Findings

No archaeological sites could be found that have been previously documented in the study area. It is anticipated that the area will contain scatters of Middle – and Late Stone Age tools with the possibility of manufacturing sites occurring locally.

The area was found to be important in terms of paleontology. Most of the paleontological deposits are located deeper than 10m underground. Information currently available is based on core drill samples taken from the area and as a result it is possible that the prospecting drilling could compliment the paleontological research rather than hinder it.

4.1 Fieldwork Results

No fieldwork was performed.

Chapter 3

IMPACT ASSESSMENT

5. METHODOLOGY

5.1 INVENTORY

Inventory studies involve the recording of archaeological resources within a proposed study area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984)*.

5.2 EVALUATING HERITAGE IMPACTS

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

This Desktop Heritage Impact Assessment relies on the analysis of written documents, maps, aerial photographs and other archival sources. No site investigations were done.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies
- Internet Search
- Historic Maps
- 1970, 1988 and 2003 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo surveys
- Google Earth 2018 imagery
- Published articles and books
- JSTOR Article Archive

6. MEASURING IMPACTS

In 2003 the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

6.1 TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

6.2 TYPE OF SIGNIFICANCE

6.2.1 Historic Value

It is important in the community, or pattern of history.

- Important in the evolution of cultural landscapes and settlement patterns
- Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organization of importance in history.

- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery.

- Importance for a direct link to the history of slavery in South Africa.

6.2.2 Aesthetic Value

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

- Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
- Importance for its creative, design or artistic excellence, innovation or achievement.
- Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
- In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

6.2.3 Scientific Value

It has potential to yield information that will contribute to an understanding of natural or cultural heritage.

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

(a) Does the site contain evidence, which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms

- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

(b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

(c) Does the site contain evidence which can make important contributions to paleoenvironmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

(d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

6.2.4 Social Value

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site
- technical and economic feasibility of restoration and development for public use
- visibility of cultural features and their ability to be easily interpreted
- accessibility to the public
- opportunities for protection against vandalism
- representativeness and uniqueness of the site
- aesthetics of the local setting
- proximity to established recreation areas
- present and potential land use
- land ownership and administration
- legal and jurisdictional status

local community attitude toward development

(b) Does the site receive visitation or use by tourists, local residents or school groups?

6.2.5 Ethnic Significance

(a) Does the site presently have traditional, social or religious importance to a particular group or community?

- ethnographic or ethno-historic reference
- documented local community recognition or, and concern for, the site

6.2.6 Economic Significance

(a) What value of user-benefits may be placed on the site?

- visitors' willingness-to-pay
- visitors' travel costs

6.2.7 Scientific Significance

(a) Does the site contain evidence, which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?
(b) Does the site contain evidence, which can make important contributions to other scientific disciplines or industry?

6.2.8 Historic Significance

(a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?
(b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?
(c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?
(d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

6.2.9 Public Significance

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- visibility and accessibility to the public
- ability of the site to be easily interpreted
- opportunities for protection against vandalism
- economic and engineering feasibility of reconstruction, restoration and maintenance
- representativeness and uniqueness of the site
- proximity to established recreation areas
- compatibility with surrounding zoning regulations or land use
- land ownership and administration
- local community attitude toward site preservation, development or destruction
- present use of site

(b) Does the site receive visitation or use by tourists, local residents or school groups?

6.2.10 Other

(a) Is the site a commonly acknowledged landmark?
(b) Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
(c) Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
(d) Is the site representative of a particular architectural style or pattern?

6.3 Degrees of Significance

6.3.1 Significance Criteria

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be taken into account when evaluating heritage resources. For any site, explicit criteria are used to measure these values. Checklists of criteria for evaluating pre-contact and post-contact archaeological sites are provided in Appendix B and Appendix C. These checklists are not intended to be exhaustive or inflexible. Innovative approaches to site evaluation which emphasize quantitative analysis and objectivity are encouraged. The process used to derive a measure of relative site significance must be rigorously documented, particularly the system for ranking or weighting various evaluated criteria.

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information, which, if properly recovered, will enhance understanding of Southern African human history, is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population *(Smith, L.D. 1977)*.

6.3.2 Rarity

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

6.3.3 Representivity

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined.

Table 4. Determination of Heritage Significance

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

7. Assessment of Heritage Potential

7.1 Assessment Matrix

7.1.1 Determining Archaeological Significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

The table below is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Table 5. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deaon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3

A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Table 6. Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

7.2 Assessing site value by attribute

The table above is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

7.3 Impact Statement

7.3.1 Assessment of Impacts

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions, which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

(a) destruction or alteration of all or part of a heritage site;

(b) isolation of a site from its natural setting; and

(c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions.

They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined below:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

7.4 Indicators of Impact Severity

Magnitude
The amount of physical alteration or destruction, which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity
The irreversibility of an impact. Adverse impacts, which result in a totally irreversible and irretrievable loss of heritage value, are of the highest severity.

Duration
The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range
The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency
The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

Diversity
The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect
A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change
The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. *(Zubrow, Ezra B.A., 1984).*

7.5 Historic Significance

No	Criteria	Significance Rating
1	Are any of the identified sites or buildings associated with a historical person or group? No	N/A
2	Are any of the buildings or identified sites associated with a historical event? No	N/A
3	Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity? No	N/A
4	Are any of the identified sites or buildings of archaeological significance? No	N/A
5	Are any of the identified buildings or structures older than 60 years? No	N/A

7.6 Architectural Significance

No	Criteria	Rating
1	Are any of the buildings or structures an important example of a building type? No	N/A
2	Are any of the buildings outstanding examples of a particular style or period? No	N/A
3	Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship? No	N/A
4	Are any of the buildings an example of an industrial, engineering or technological development? No	N/A
5	What is the state of the architectural and structural integrity of the building? No	N/A
6	Is the building's current and future use in sympathy with its original use (for which the building was designed)? N/A	N/A
7	Were the alterations done in sympathy with the original design? N/A	N/A
8	Were the additions and extensions done in sympathy with the original design? N/A	N/A
9	Are any of the buildings or structures the work of a major architect, engineer or builder?	

	No.	N/A

7.7 Spatial Significance

Even though each building needs to be evaluated as a single artefact the site still needs to be evaluated in terms of its significance in its geographic area, city, town, village, neighborhood or precinct. This set of criteria determines the spatial significance.

No	Criteria	Rating
1	Can any of the identified buildings or structures be considered a landmark in the town or city? No	-
2	Do any of the buildings contribute to the character of the neighborhood? No	-
3	Do any of the buildings contribute to the character of the square or streetscape? No	-
4	Do any of the buildings form part of an important group of buildings? No	-

8. Impact Evaluation

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

8.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics, which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity if the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

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 total number of points scored for each impact indicates the level of significance of the impact.

8.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the heritage environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

8.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

NATURE		
Including a brief description of the impact of the heritage parameter being assessed in the context of the project. This criterion includes a brief written statement of the heritage aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
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).
REVERSIBILITY		
This describes the degree to which an impact on a heritage parameter 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 heritage 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.
DURATION		
This describes the duration of the impacts on the heritage parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects 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 and its effects 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 – 50 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 transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the heritage parameter. A cumulative effect/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.
INTENSITY / MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

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. This describes the significance of the impact on the heritage parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

9. Anticipated Impact of the Development

9.1 All Heritage Significant Sites

9.1.1 Palaeontology

IMPACT TABLE FORMAT		
Heritage component	*Palaeontological deposits of significance*	
Issue/Impact/Heritage Impact/Nature	*Stompoor 109: Palaeontology.*	
Extent	*Local*	
Probability	*Likely*	
Reversibility	*Partly Reversible*	
Irreplaceable loss of resources	*Significant loss of resources*	
Duration	*Medium term*	
Cumulative effect	*High cumulative effect*	
Intensity/magnitude	*Low*	
Significance Rating of Potential Impact	*8 points. The impact will have a low negative impact rating.*	
	Pre-mitigation impact rating	*Post mitigation impact rating*
Extent	*2*	*2*
Probability	*4*	*1*
Reversibility	*3*	*2*
Irreplaceable loss	*3*	*1*
Duration	*2*	*2*
Cumulative effect	*3*	*1*
Intensity/magnitude	*3*	*1*
Significance rating	*51 (High negative)*	*8 (low positive)*
Mitigation measure	*It is recommended that a suitably qualified palaeontologist be approached to assist with the core drill placements. This could result in the prospecting adding positively to the paleontological record rather than damage it.*	

9.1.2 Archaeological Sites

IMPACT TABLE FORMAT	
Heritage component	*Archaeological heritage sites of significance*
Issue/Impact/Heritage Impact/Nature	*Stone Age Sites*
Extent	*Local*
Probability	*Unlikely*
Reversibility	*Totally Reversible*
Irreplaceable loss of resources	*Insignificant loss of resources*
Duration	*Medium term*

Cumulative effect	*Low cumulative effect*	
Intensity/magnitude	*Low*	
Significance Rating of Potential Impact	*8 points. The impact will have a low negative impact rating.*	
	Pre-mitigation impact rating	*Post mitigation impact rating*
Extent	*2*	*2*
Probability	*2*	*1*
Reversibility	*3*	*2*
Irreplaceable loss	*3*	*1*
Duration	*1*	*2*
Cumulative effect	*1*	*1*
Intensity/magnitude	*3*	*1*
Significance rating	*36 (medium negative)*	*8 (low negative)*
Mitigation measure	*Should any sites be encountered the appropriate heritage practitioner should be informed.*	

9.2 Assessing Visual Impact

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

9.3 Assumptions and Restrictions

- It is assumed that the South African Heritage Resources Information System (SAHRIS) database locations are correct
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the Basic Assessment will result in the identification of any intangible sites of heritage potential.

10. Assessment of Impacts

10.1 Impact Statement

10.1.1 Paleontological sites

The area has produced significant paleontological finds over the last couple of decades and this should be taken into account during the evaluation of the heritage significance of the study area. The paleontological finds were however largely based on the results of core drilling themselves. As such it is recommended that a paleontologist be involved in the planning of the drilling sites and that core sample be made available for paleontological study during the prospecting phase. This will result in the project adding to the paleontological knowledge of the site, rather than damage it.

10.1.2 Built Environment

Some structures associated with rural living were identified;

- Brick outbuildings (modern and historic)
- Livestock enclosures (modern)
- Barb-wire fences (modern)
- Mud-brick huts (modern)
- Farm Homestead
- Dirt roads (modern)
- Footpaths

10.1.3 Pre-Contact Sites

The study area contained a few areas with isolated stone tools. None of these represented an occupational or manufacturing site.

10.1.4 Post-Contact Sites

No post contact sites were identified.

10.1.5 Cultural Landscape

The following landscape types were identified during the study.

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Fossil remains	Yes, sub-surface	Likely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Unlikely
3 Historic Built Environment	- Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement	No	No
4 Historic Farmland	These possess distinctive patterns of settlement and historical features such as: - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.	No	No
5 Historic rural town	- Historic mission settlements - Historic townscapes	No	No
6 Pristine natural landscape	- Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years	No	Unlikely

	- Pre-colonial or historical burial sites - Geological sites of cultural significance.		
7 Relic Landscape	- Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement,	No	No
8 Burial grounds and grave sites	- Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years)	No	No
9 Associated Landscapes	- Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory	No	No
10 Historical Farmyard	- Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology	No	No
11 Historic institutions	- Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases	No	No
12 Scenic visual	- Scenic routes	No	No
13 Amenity landscape	- View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors	No	No

10.1.6 Mitigation

It is recommended that the development designs consider the positive and negative characteristics of the existing cultural landscape type and that they endeavor to promote the positive aspects while at the same time mitigating the negative aspects.

11. Resource Management Recommendations

This study analysed the documented data available as well as investigated the surface occurrences of heritage sites for Stompoor 109 in the Northern Cape Province, near the town of Prieska.

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity (50m radius of the site) should cease.
- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains the South African Police Services (SAPS) should be notified.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyse the finds.

12. Conclusion

The area has produced significant paleontological finds over the last couple of decades and this should be considered during the evaluation of the heritage significance of the study area. The paleontological finds were however largely based on the results of core drilling themselves. As such it is recommended that a paleontologist be involved in the planning of the drilling sites and that core sample be made available for paleontological study during the prospecting phase. This will result in the project adding to the paleontological knowledge of the site, rather than damage it.

There is a possibility of finding surface Stone Age manufacturing sites in the area. It is recommended that the specific borehole locations be checked by a suitably qualified heritage practitioner when their locations have been finalized.

13. References Researched and Cited

General Information for archaeologists and palaeontologists on the National Heritage Resources Act (No 25 of 1999).

National Heritage Resources Act (No. 25 of 1999).

National Heritage Resources Act (No 25 of 1999). 2002. Regulations.

SAHRA. 2002. General Introduction to surveys, impact assessments and management plans.

Beaumont, P.B. and Boshier A.K. (1974). *Report on Test Excavations in a Prehistoric Pigment Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol.29, No 113/114 (Jun., 1974), pp. 41 – 59.

Bergh, J.S. 1999 Geskiedenisatlas van die Vier Noordelike Provinsies. Van Schaik, Pretoria.

Breutz, P.J. 1963. The Tribes of the Districts of Kuruman and Postmasburg. Department of Bantu Administration and Development, Ethnological Publication No. 49.

Couzens, R., Sadr, K. *Rippled Ware at Blinklipkop, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 196 – 203.

Forssman, T.R., Kuman, K, Leader, G.M., Gibbon, R.J. *A Later Stone Age Assemblage from Canteen Kopje, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 204-214.

Humphreys, A.J.B. *Note on the Southern Limits of Iron Age Settlement in the Northern Cape*. The South African Archaeological Bulletin, Vol 31, No. 121/122 (jun., 1976), pp. 54-57.

Humphreys, A.J.B., *Cultural Material from Burials on the Farm St. Cair, Douglas Area, Northern Cape*. The South African Archaeological Bulletin, Vol 37, No. 136 (Dec., 1982), pp. 68-70.

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

Mitchell, P. 2002. The Archaeology of Southern Africa. Cambridge University Press, Cambridge.

S.A. Manganese, 1977. Kalahari Wealth: The Story of Manganese 1926 - 1976. Purnell, Cape Town.

Snyman, P.H.R. 1983. Postmasburg: ‘n Geskiedkundige Oorsig. Human Sciences Research Council, Pretoria.

Snyman, P.H.R. 1983. Die Ontstaan en Groei van Postmasburg in Contree No. 13, pp. 4 - 26.

Thackeray, A.I., Thackeray J.F., Beaumont, P.B. *Excavations at the Blinkklikop Specularite Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol. 38, No. 137 (Jun., 1983), pp. 17-25.

Rudner, J., Rudner, I. *Rock-Art in the Thirstland Areas*. The South African Archaeological Bulletin, Vol.23, No. 91 (Dec., 1968), pp. 75-89.

Strydom, C.J.S., Kaapland en die Tweede Vryheidsoorlog (Kaapstad, 1937), pp. 107-108 en 113.