

**HIA FOR THE MOYENI WATER TREATMENT  
WORKS, KZN**

**FOR TERRATEST (Pty) Ltd**

**DATE: 6 MAY 2021**

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## Abbreviations <sup>1</sup>

HP	Historical Period (1820 ACE onwards for KZN)
IIA	Indeterminate Iron Age
LIA	Late Iron Age 1100 – 1820 ACE
EIA	Early Iron Age 200 – 1100 ACE
ISA	Indeterminate Stone Age
ESA	Early Stone Age 1.5mya – 250 000 years ago
MSA	Middle Stone Age 250 000 – 40 000 years ago
LSA	Late Stone Age 40 000 1 000 years ago
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

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<sup>1</sup> Dates are approximate dates and refer to KZN only.

## INTRODUCTION

The Moyeni Water Treatment Works currently receives water from the existing abstraction point at the adjacent canal and is able to treat 4ML of water per day. Treated water is pumped from the WTW to a reservoir (existing capacity 500KI) about 3km away and distributed to the community. Given the increase in demand for treated water, the WTW requires upgrades to the plant and rising main pipeline.

The proposed upgrade (Phase 1) will allow for the treatment of 10ML/day. Additional water will be pumped from existing abstraction point at the adjacent canal. The bulk rising main route is planned to follow the existing road but may be revised to avoid houses built very close to the road. Thus, a 20m buffer has been mapped along the proposed pipeline route to provide a 40m corridor, if re-routing is required. The pipeline will be High Density Polyethylene (HDPE) with a diameter of 650mm and flow rate 780m<sup>3</sup>/hr.

The following components form part of the proposed Phase 1 upgrades:

- Pump station upgraded at the Moyeni River canal abstraction point;
- Installation of a new pipe from the abstraction point to the WTW (likely 115m);
- Installation of a new rising main that will involve:
  - 3 500m of 650mm diameter HDPE pipe with a flow rate of 780 m<sup>3</sup> per hr;
- Road crossings;
- Air, scour and isolating valves;
- Pressure reducing valve chamber;
- Pipe jacking under road;

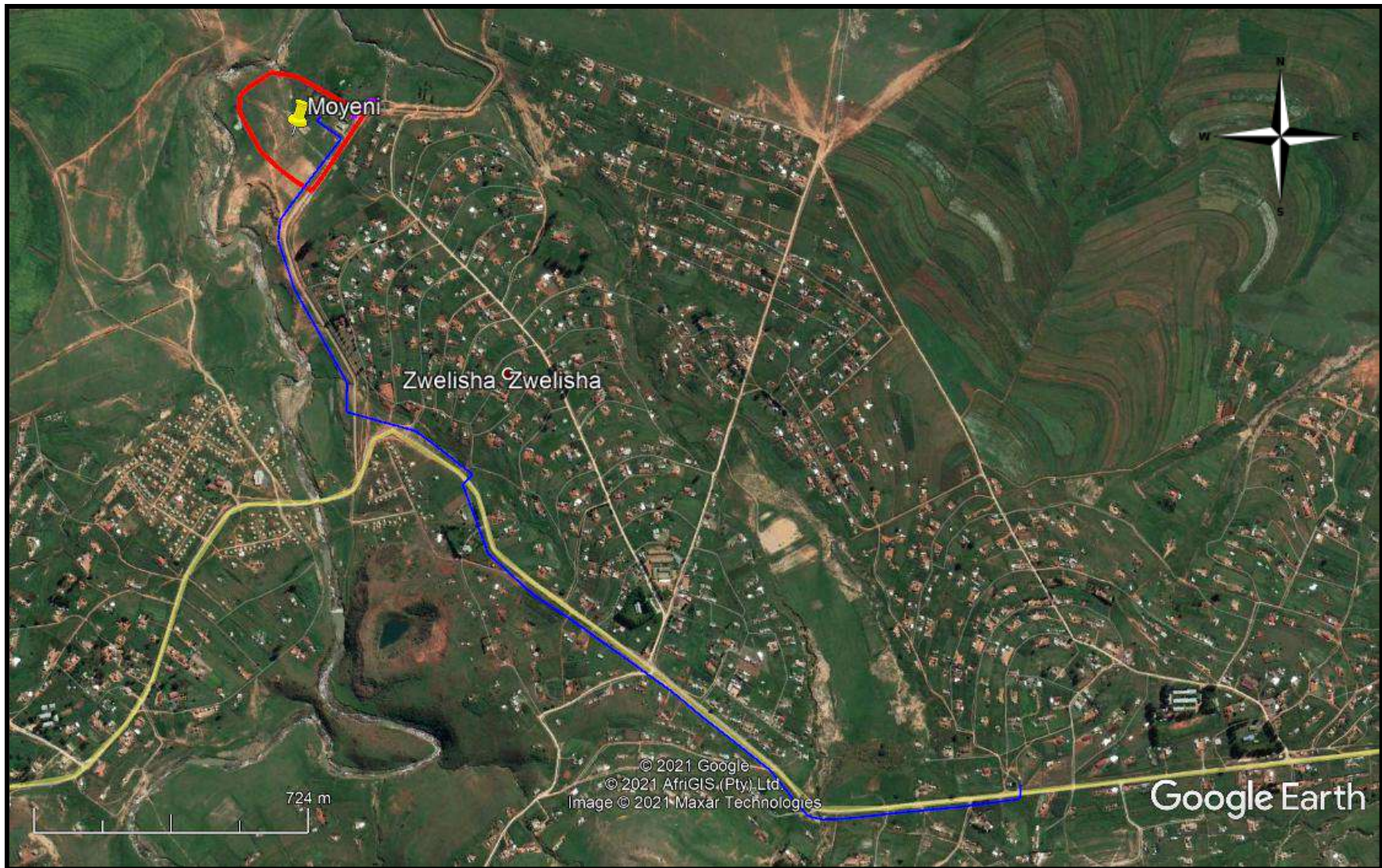
- Pipe jacking under existing canal;
- Pipe route markers and thrust blocks.

The intention is to then increase the WTW capacity to allow for the treatment of 20ML/day during a second expansion in the future (Phase 2). Water will likely be sourced from the Woodstock Dam during this phase.

Umlando was requested to undertake an assessment of the proposed development. Figures 1 – 4 show the location of the development.



**FIG. 1 GENERAL LOCATION OF THE PROPOSED DEVELOPMENT**



**FIG. 2: AERIAL OVERVIEW OF THE PROPOSED DEVELOPMENT**

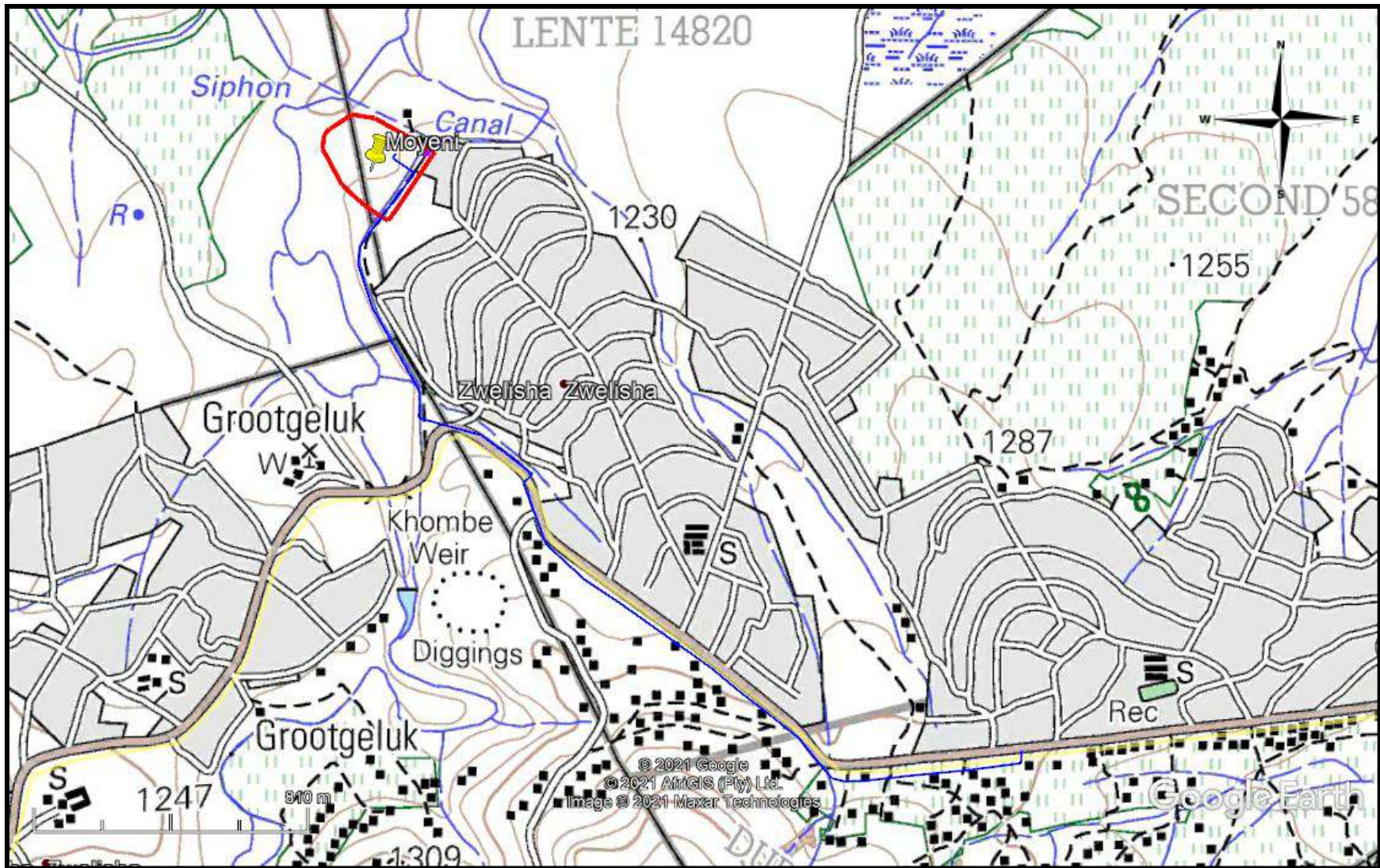


FIG. 3: TOPOGRAPHICAL MAP OF THE PROPOSED DEVELOPMENT (2002)





**FIG. 4: SCENIC VIEW OF THE STUDY AREA**

**KWAZULU NATAL AMAFA AND RESEARCH INSTITUTE, ACT 05, 2018**

“General protection: Structures.—

- No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Council having been obtained on written application to the Council.
- Where the Council does not grant approval, the Council must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- The Council may, by notice in the *Gazette*, exempt—
- A defined geographical area; or
- defined categories of sites within a defined geographical area, from the provisions of subsection where the Council is satisfied that heritage resources falling in the defined geographical area or category have been identified and are adequately protected in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.

General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—

- the grave of a victim of conflict;
- a cemetery made up of such graves; or
- any part of a cemetery containing such graves, without the prior written approval of the Council having been obtained on written application to the Council.
- General protection: Traditional burial places.—
- No grave—
- not otherwise protected by this Act; and
- not located in a formal cemetery managed or administered by a local authority, may be damaged, altered, exhumed, removed from its original

position, or otherwise disturbed without the prior written approval of the Council having been obtained on written application to the Council.

The Council may only issue written approval once the Council is satisfied that—

- the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
- the applicant and the relevant communities or individuals have reached agreement regarding the grave.

General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

- No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- Upon discovery of archaeological or palaeontological material or a meteorite by any person, all activity or operations in the general vicinity of such material or meteorite must cease forthwith and a person who made the discovery must submit a written report to the Council without delay.
- The Council may, after consultation with an owner or controlling authority, by way of written notice served on the owner or controlling authority, prohibit any activity considered by the Council to be inappropriate within 50 metres of a rock art site.
- No person may exhume, remove from its original position or otherwise disturb, damage, destroy, own or collect any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- No person may bring any equipment which assists in the detection of metals and archaeological and palaeontological objects and material, or

excavation equipment onto any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, or meteorite impact site, or use similar detection or excavation equipment for the recovery of meteorites, without the prior written approval of the Council having been obtained on written application to the Council.

- The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government.”

## **METHOD**

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. This databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (<http://www.vuvuzela.com/googleearth/monuments.html>) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1<sup>st</sup> and 2<sup>nd</sup> edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

### **Defining significance**

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

#### **1. State of preservation of:**

- 1.1. Organic remains:
  - 1.1.1. Faunal
  - 1.1.2. Botanical
- 1.2. Rock art
- 1.3. Walling
- 1.4. Presence of a cultural deposit
- 1.5. Features:
  - 1.5.1. Ash Features
  - 1.5.2. Graves

- 1.5.3. Middens
- 1.5.4. Cattle byres
- 1.5.5. Bedding and ash complexes

**2. Spatial arrangements:**

- 2.1. Internal housing arrangements
- 2.2. Intra-site settlement patterns
- 2.3. Inter-site settlement patterns

**3. Features of the site:**

- 3.1. Are there any unusual, unique or rare artefacts or images at the site?
- 3.2. Is it a type site?
- 3.3. Does the site have a very good example of a specific time period, feature, or artefact?

**4. Research:**

- 4.1. Providing information on current research projects
- 4.2. Salvaging information for potential future research projects

**5. Inter- and intra-site variability**

- 5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?
- 5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

**6. Archaeological Experience:**

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

**7. Educational:**

- 7.1. Does the site have the potential to be used as an educational instrument?
- 7.2. Does the site have the potential to become a tourist attraction?
- 7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

## 8. Other Heritage Significance:

- 8.1. Palaeontological sites
- 8.2. Historical buildings
- 8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites
- 8.4. Graves and/or community cemeteries
- 8.5. Living Heritage Sites
- 8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts. Table 1 lists the grading system.

**TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES**

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	
High / Medium Significance	Generally Protected A		Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B		Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C		On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

## RESULTS

### DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. Many archaeological sites occur in the general area. The archaeological sites tend to be open Stone Age scatters, overhangs with Rock Paintings, Late Iron Age walling, and Historical Period structures (fig. 5). These sites differ in their significance.

There are no recorded heritage sites within the study area. There have been no previous heritage surveys within the study area.

Figures 6 and 7 indicate that part of the Groot Geluk was leased/sold/granted shortly after 1853. The adjacent land, Keswick, was only granted in the 1890s. The colonial occupation of this area thus starts in the 1850s.

The 1969 1:50 000 topographical map indicates that part of Groot Geluk was still being used by the landowner, with a few buildings in ruin. No other features are noted on the map.



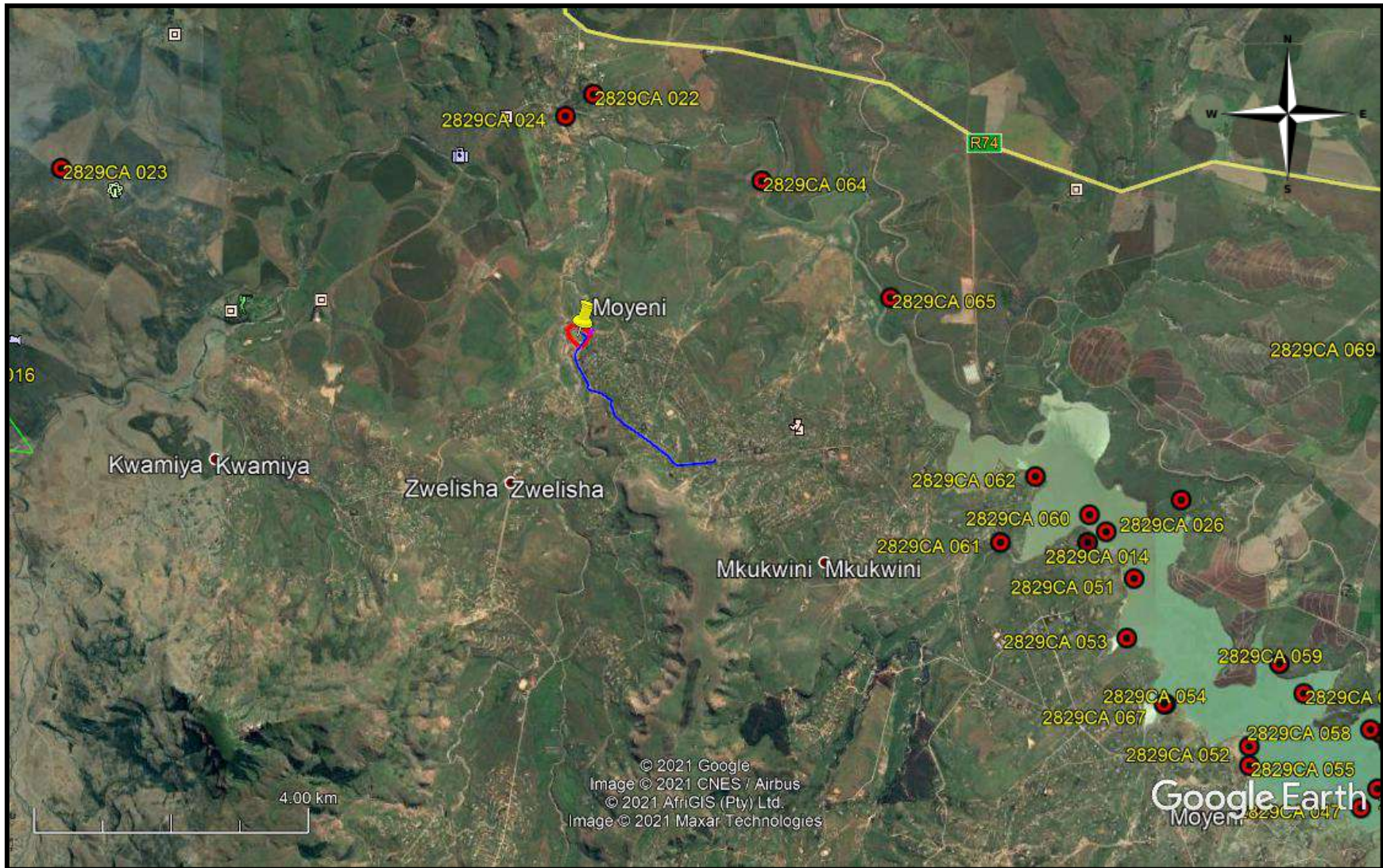


FIG. 5: LOCATION OF KNOWN HERITAGE SITES IN THE GENERAL AREA

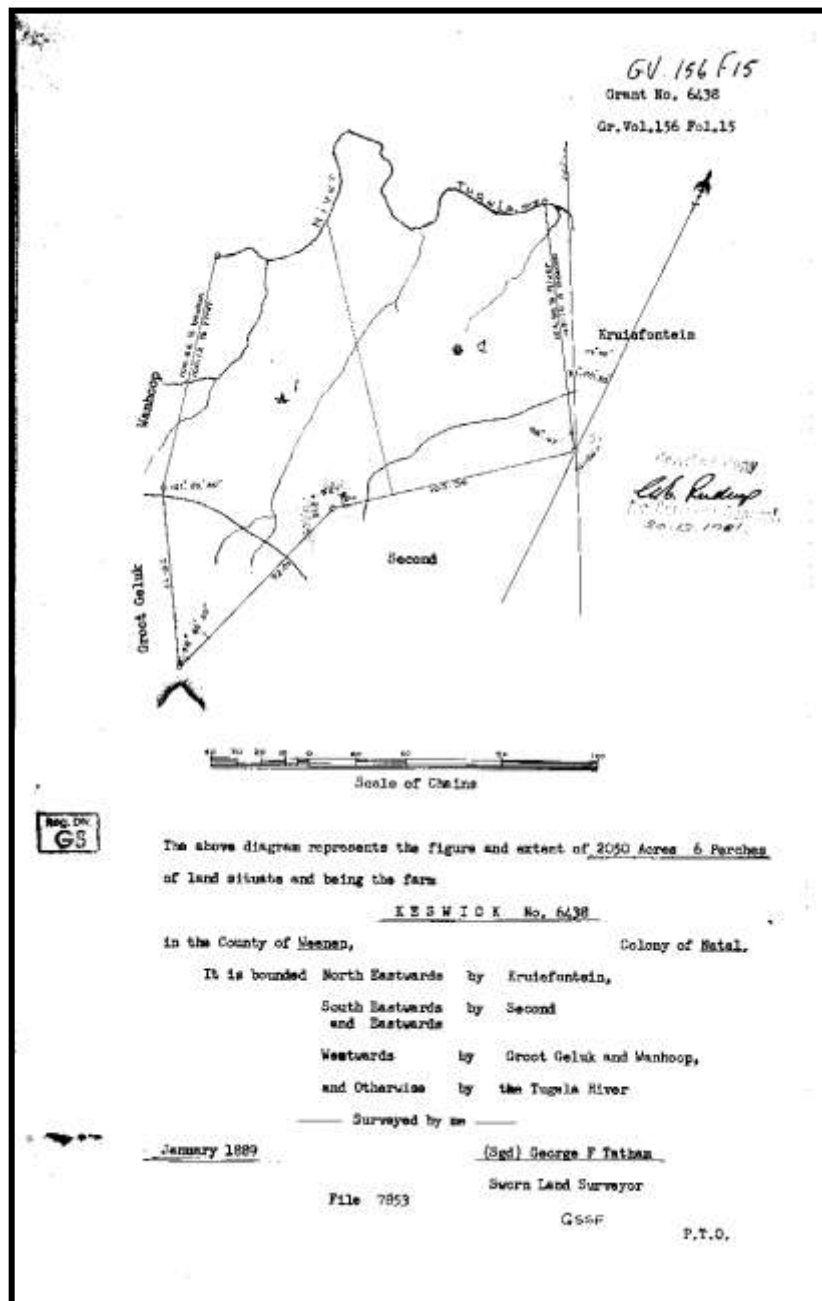


FIG. 6: SURVEYOR GENERAL MAP OF FARM KESWICK 6438 IN 1889



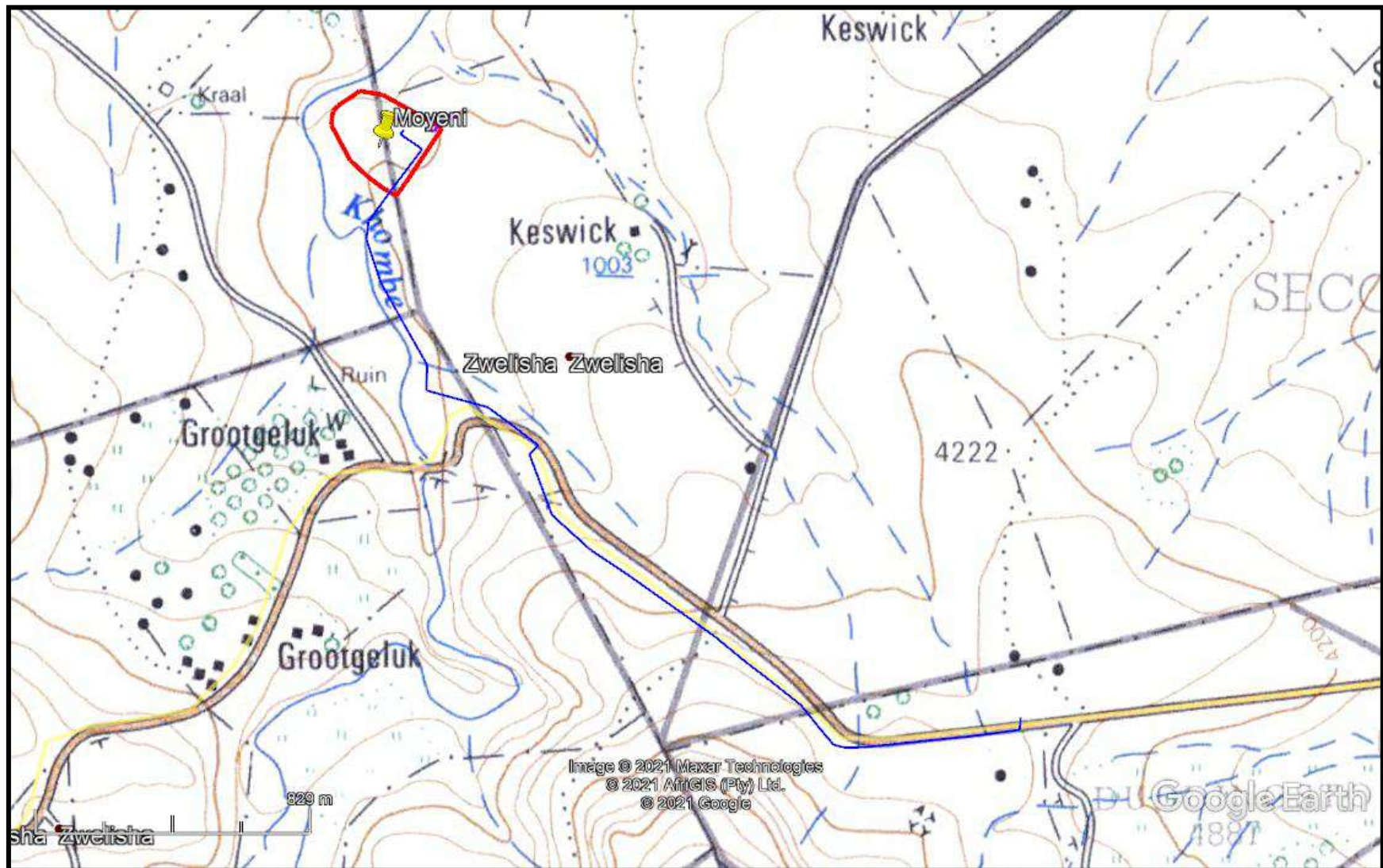


FIG. 8: STUDY AREA IN 1969

## PALAEONTOLOGICAL SENSITIVITY

The area is in an area of very high palaeontological sensitivity (fig. 9). However, the excavations for the pipeline will occur at 1.5m to 2m in depth and the lower excavations may affect palaeontological strata. These areas will require a Chance Find Protocol with a site inspection by a suitably qualified palaeontologist during the construction phase. Dr Alan Smith undertook the desktop PIA for this study (Appendix A).

“This proposed pipeline is underlain by rocks of the Adelaide Subgroup (Beaufort Group), which can contain significant Paleontological Material. However, this site is already highly disturbed due to urbanisation. Added to this the rock is weathered and it will follow an existing roadway.

Although this region is red-flagged in the Sahrís Palaeosensitivity Map (fig. 9) no purpose will be served by a pre-excavation field trip as fresh rock is not visible. A “**Chance Find Protocol**” has been inserted in case fossils are found during excavation. Should this take place then a Palaeontologist must be called to inspect the discovery. If any excavation is more than 2m deep then a field visit from a competent Palaeontologist should be arranged.”



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

**FIG. 9: PALAEOLOGICAL SENSITIVITY MAP**

## FIELD SURVEY

The field survey was undertaken on 29 April 2021. Ground visibility was very good for the entire line. The lines follow existing roads and the new rising main is either replacing, or is adjacent to, the existing water pipeline.

The only area that has not been affected by roads and pipelines is the pump station. Several stone tools occur in this area (fig.'s 10 - 11). However, these stone tools are in a secondary context, are isolated and have very low significance. The stone tools are Late Stone Age in origin and are generic tools of the last 10 000 years. No formal tools were noted. The areas is more of a scatter of stone tools than an archaeological site per se. These tools probably occur all over the Zwelitsha area. Figure 10 shows LSA cores and flakes on quartz and CCS.

Significance: The stone tolls are very low significance.

Mitigation: No further mitigation is required. No permit is required.

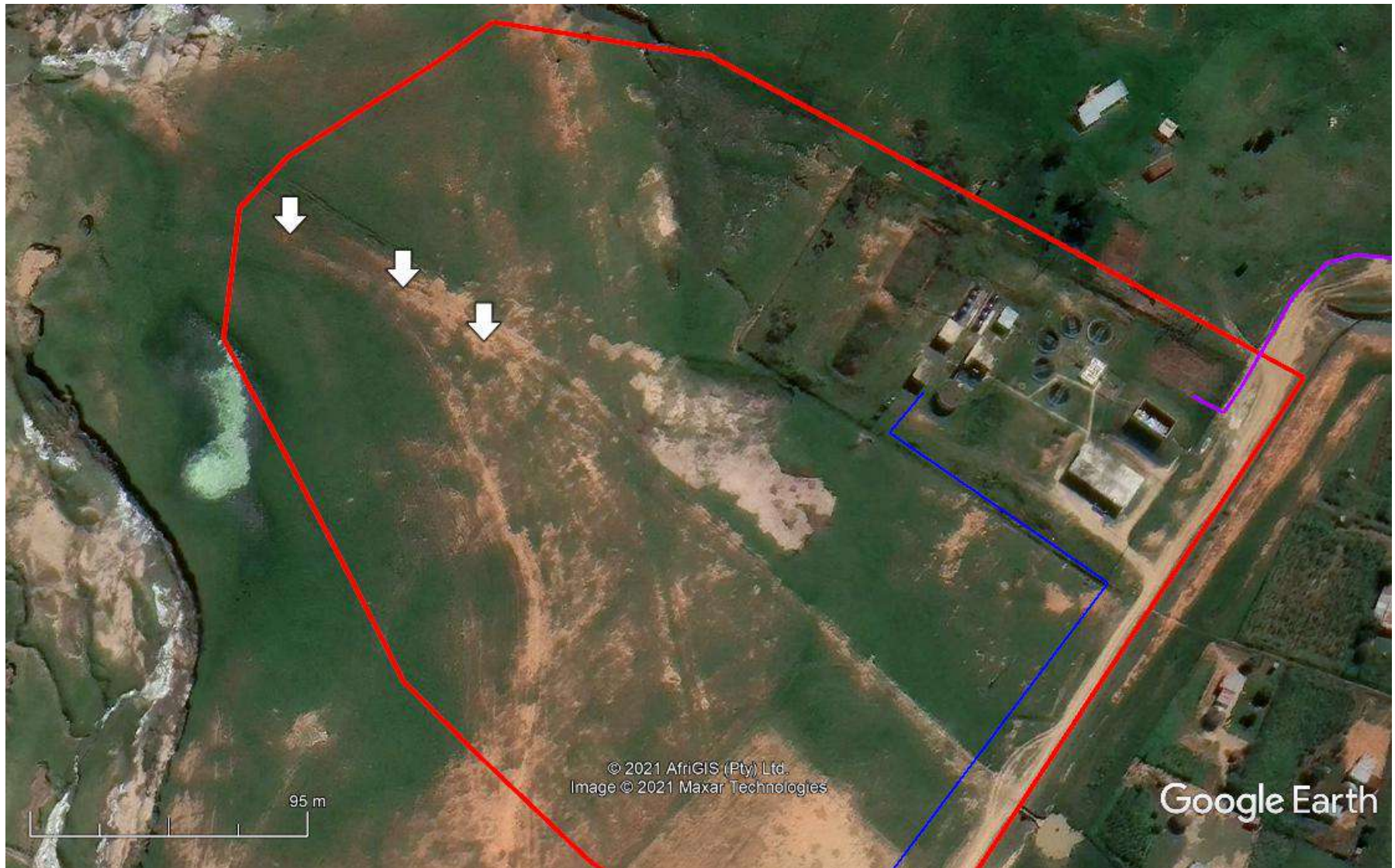
SAHRA Rating: 3c

A cemetery (28°40'41.41"S 29° 6'4.57"E) was noted along the eastern part of the pipeline. The cemetery occurs on the opposite side of the road and will not be directly affected (fig. 12). Normally a minimum of a 20m buffer. from a grave/cemetery is required and it needs to be demarcated during construction. However, since the pipeline is on the opposite side of the road, the road itself acts as a natural buffer. If any construction activity occurs on the cemetery side of the road, then the cemetery will need to be clearly demarcated.

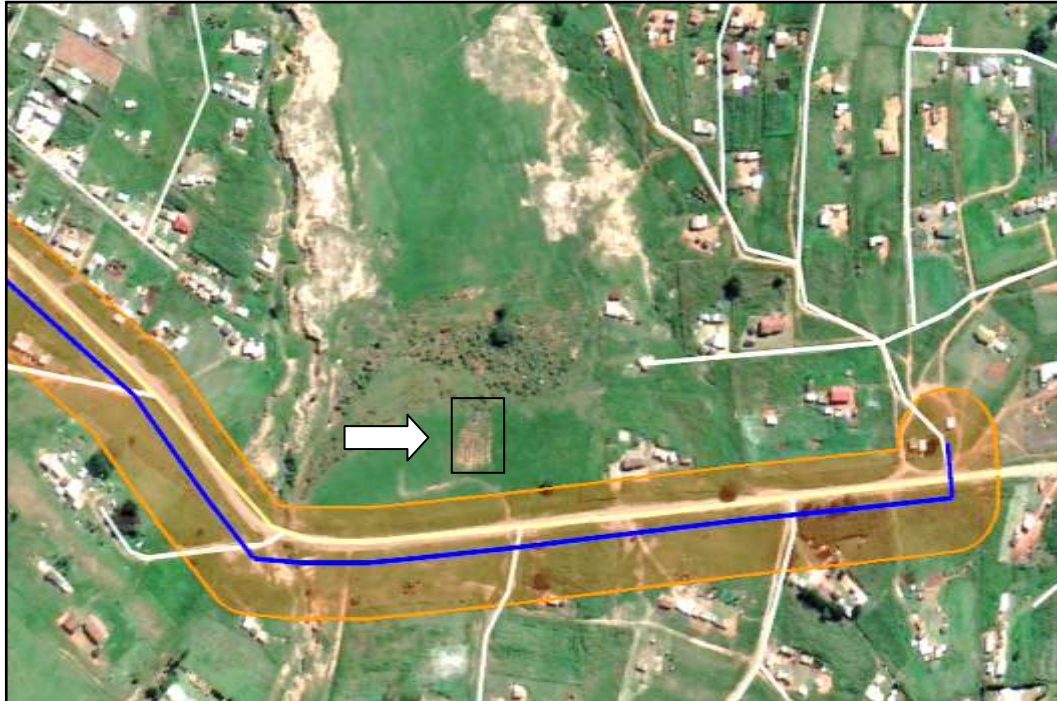


**FIG. 10: STONE TOOLS NEAR THE ABSTRACTION SITE**





**FIG. 11: LOCATION OF RECORDED STONE TOOLS**



**FIG. 12: CEMETERY TO THE NORTH OF THE PIPELINE**

## **RECOMMENDATIONS**

The proposed development will not affect heritage sites. While scatters of stone tools occur all over the study area, they are in a secondary context, part of the generic LSA stone tool assemblage and have no significance. No further mitigation is required regarding the archaeological component.

The palaeontological deposits in this area are of very high sensitivity. However, unweathered deposits only occur from 2m below the surface. A site inspection from a qualified palaeontologist will be required in those areas where the trench excavations occur below 1.5m. This will be more a case of sampling what might occur, and will not affect the project in itself.

## **CONCLUSION**

A heritage survey was undertaken for the proposed Moyeni water treatment works and associated infrastructure upgrade. Apart from the general, and isolated, Late Stone Age stone tools that were noted, no other heritage sites were recorded. The stone tools are of low significance and require no further mitigation.

The palaeontological aspect of the project requires a Chance Find Protocol. In addition to this, any excavations deeper than 1.5m will require an on-site inspection from a registered palaeontologist. The site inspection will be to immediately salvage material, and not hamper development.

## REFERENCES

2829CA Oliviershoek 1:50 000 topographical. 1969, 2000

GV 156 F15

GV 32 F7

KZN Museum database

SAHRIS database

Umlando database

### **EXPERIENCE OF THE HERITAGE CONSULTANT**

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeologist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

### **DECLARATION OF INDEPENDENCE**

I, Gavin Anderson, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in black ink, appearing to read 'G. Anderson', with a horizontal line underneath.

Gavin Anderson  
Archaeologist/Heritage Impact Assessor

**APPENDIX A**  
**PIA DESKTOP STUDY**

**DESK-TOP PALAEOLOGICAL REPORT FOR THE PROPOSED MOYENI  
BULK PIPELINE NEAR BERGVILLE, KWAZULU - NATAL**

**FOR**

**UMLANDO: Archaeological Surveys & Heritage Management**

**by**

**Dr Alan Smith**

**Alan Smith Consulting**

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**9 May, 2021**

## Declaration of Independence

This report has been compiled by Dr Alan Smith (Pr. Sc. Nat.) of Alan Smith Consulting, Durban. The views expressed in this report are entirely those of the author, if not then the source has been duly acknowledged. No other interest was displayed during the decision making process for the Project.

Specialist: Dr Alan Smith

Signature:





## EXECUTIVE SUMMARY

This proposed pipeline is underlain by rocks of the Adelaide Subgroup (Beaufort Group), which can contain significant Paleontological Material. However, this site is already highly disturbed due to urbanisation. Added to this the rock is weathered and it will follow an existing roadway.

Although this region is red-flagged in the Sahris Palaeosensitivity Map no purpose will be served by a pre-excavation field trip as fresh rock is not visible. A “**Chance Find Protocol**” has been inserted in case fossils are found during excavation. Should this take place then a Palaeontologist must be called to inspect the discovery. If any excavation is more than 2m deep then a field visit from a competent Palaeontologist should be arranged.

## 1. BACKGROUND AND PROPOSED PROJECT

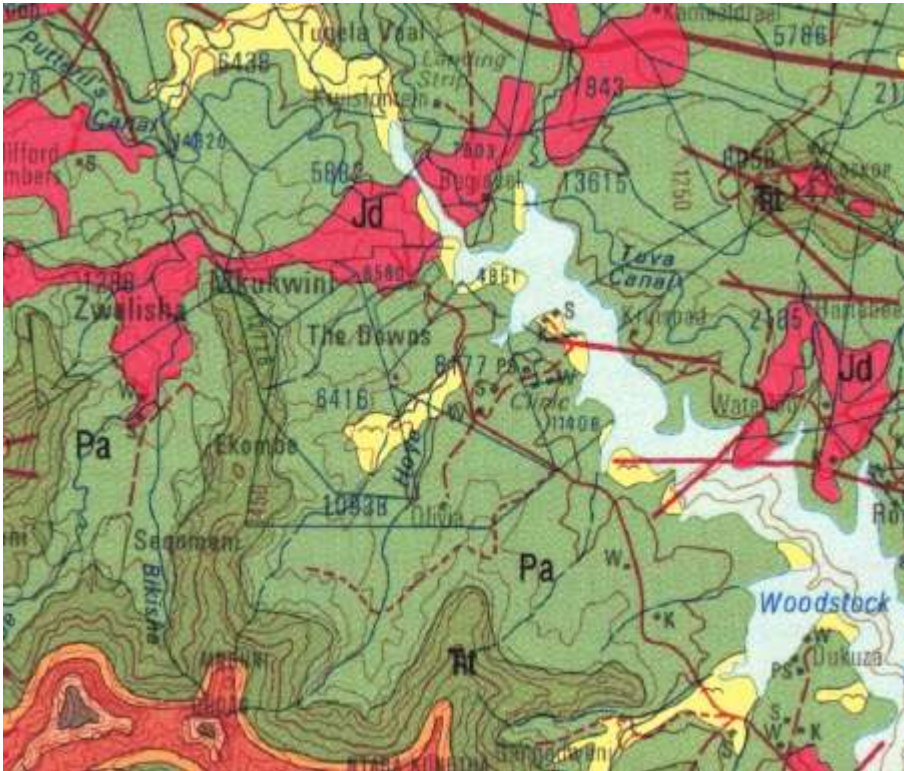
It is proposed that a new Bulkwater Pipeline be constructed in Moyeni, Near Bergville (Figure 1).



**Figure 1: Location of the proposed Bulkwater Pipeline project. Source map GoogleEarth.**

## 2. GEOLOGY

The proposed project site is located within the Adelaide Subgroup of the Beaufort Group (Figure 2).



**Figure 2: Extract from the Harrismith 2828 1:250 000 Geological Map. Green (Pa) is described as Adelaide Subgroup and Red (Jd) is Karoo Dolerite.**

The Beaufort Group (part of the Karoo Supergroup) is a sequence of fluvio-lacustrine sedimentary rocks that accumulated in a landlocked, intracratonic foreland basin in SW Gondwana during the Middle Permian to Middle Triassic (Neveling et al., 2005).

The Lower Beaufort Group is represented by the Adelaide (SACS, 1980). In Kwazulu-Natal the lower Beaufort Group is represented by the Permian Estcourt Formation, which forms flat terrain, the middle, by the Belmont Formation, and the upper by the Otterburn Formation (Green, 1998). This subdivision is not represented on the Harrismith geological map (Figure 2). These rocks formed from sediments originally deposited within a fluvial-floodplain constructed by meandering rivers in a semi-arid climate (Figure 3),

flowing into a large inland sea (Karoo Sea). Lacustrine environments alternate with fluvial environments indicating a series of transgressive-regressive lacustrine episodes (Green, 1998). Karoo Dolerite which forms koppies within this area.



**Figure 3: River channel cutting down into red shales of the Adelaide Sub-Group near Bergville.**

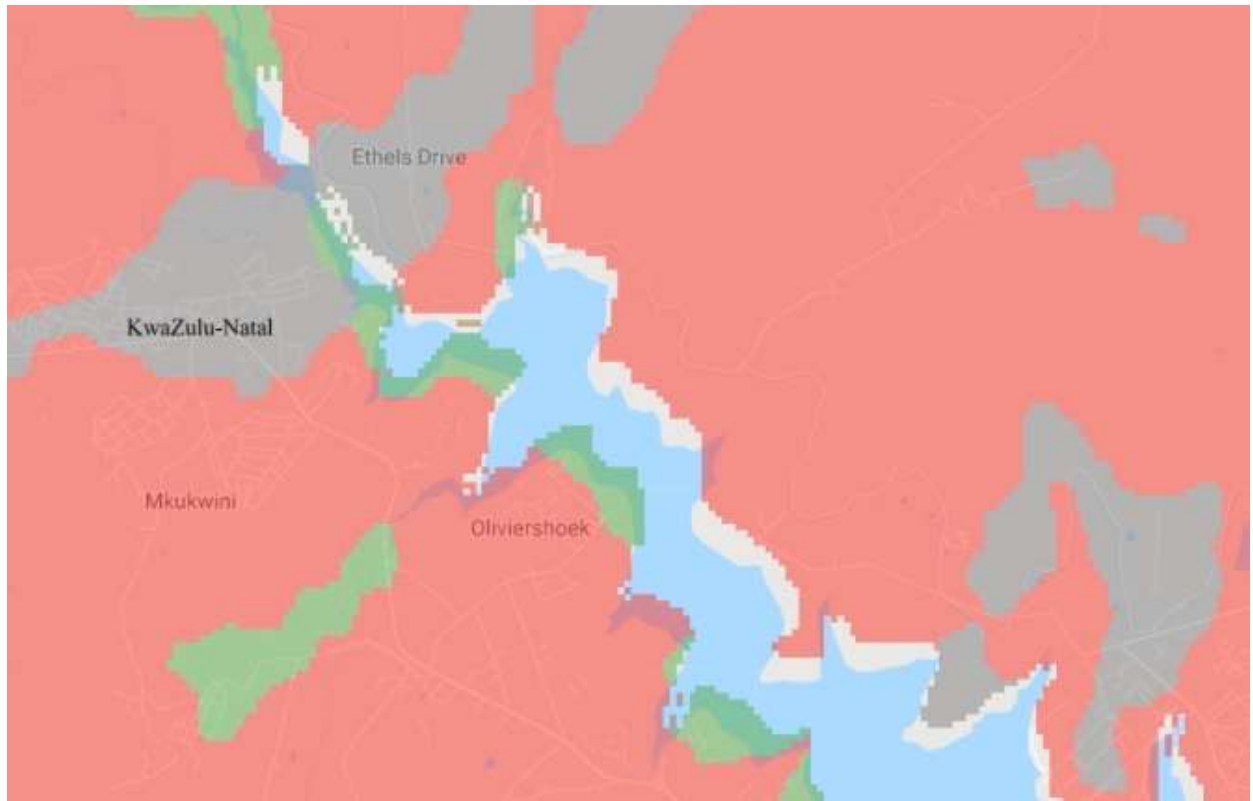
### ***Dolerite***

Karoo dolerite intrusions may be present. These are 184 million years (Ma) old and represent the onset of the break-up of the Gondwana Supercontinent (Hastie et al (2014). According to Watkeys (2006), Gondwana rifting commenced between 155 and 135 Ma.

## **3. PALAEOLOGY**

The Lower Beaufort Group rocks are classified red on the Sahrís Map (Figure 4). Bergville is located within Permian Era rocks, about 50m below the Permo-Triassic Boundary. This figure was abstracted from the Harrismith Geological Map and could be out by +/-20m due to the map's contour control. The Upper Permian is separated from the Triassic by an Extinction Event (known as the Great Dying) when 95% of life on Earth became extinct. The reasons for this are still controversial. There have been five great extinction events in the Phanerozoic Era (541 Mya till Present). Off these the Permo-Triassic Boundary represents the greatest extinction event in the Earth's history.

This stratigraphic boundary is expected to be found within marine sediments where a complete time record may accumulate. In contrast the Adelaide Subgroup comprises terrestrial sediments sedimentary rocks. Preservation requires a large number of geological processes to come together, but these are less likely to take place during terrestrial deposition. Consequently the placement of the Permo-Triassic Boundary is not accurately known, if it has in fact been preserved in southern Africa, but it must be considered. Present evidence indicates that the Permo-Triassic Boundary is unlikely to be located in the development area.



**Figure 4: Palaeosensitivity of rocks in the Bergville area.**

### **Trace fossils**

Evidence of bioturbation is ubiquitous within the Adelaide Subgroup siltstones and mudstones, however the various trace fossil (ichnofossil) types are not always identifiable. Trace fossils are very common within the Beaufort Group (Figures 5 & 6). These have limited **Palaeontological** usage.



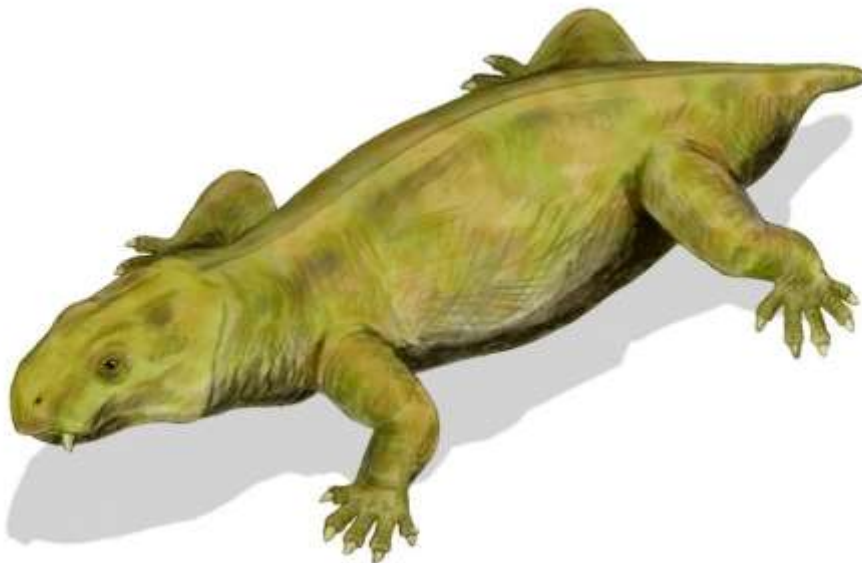
**Figure 5: Examples of trace fossils found near Bergville. This could be *Arenicolites*.**



**Figure 6: Trace fossils of unknown species, possibly a shrimp, found near Bergville.**

## Vertebrate Fossils

The Beaufort Group is known internationally for its fossils (Cisneros et al., 2008). It contains plant- and animal- fossils. The latter include a wide variety of body fossils, including the mammal-like reptiles such as the Upper Permian- Dicynodon (Figure 7) and the Triassic- aged Lystrosaurus (Neveling et al., 2005) and trace fossils (Green, 1997). The Adelaide Subgroup known world-wide for its fossils



**Figure 7: Dicynadon reproduction (Wikipedia).**

## Karoo Dolerite

Karoo Dolerite is also present. This is an igneous intrusive rock and by definition cannot be fossiliferous.

## Paleontological Material Discussion

Significant Palaeontological Material could be found on site. However there are several mitigating factors:



1. The site is highly disturbed as this is a refurbishment project
2. It follows an existing road so will be disturbed
3. The site is highly weathered and no fresh rock is exposed.

These factors mitigate against a field visit. It is possible that Paleontological Material could be exposed during site excavation, consequently a **Chance Find Protocol** has been inserted.

#### 4. CHANCE FIND PROTOCOL

As this site includes areas flagged red on the SAHRIS PalaeoSensitivity Map (Fig. 4), a “Chance Find Protocol” is **Recommended**.

In the case of any unusual finds, a Palaeontologist must be notified immediately by the ECO and/or EAP and a site visit must be arranged at the earliest possible time with the Palaeontologist.

In the case of the ECO or the Site Manager becoming aware of suspicious looking palaeo-material:

- The construction must be halted in that specific area and the Palaeontologist must be given enough time to reach the site and remove the material before excavation continues.
- Mitigation will involve the attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labeled, boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

## **Functional responsibilities of the Developer**

1. At full cost to the project, and guided by the appointed Palaeontological Specialist, ensure that a representative archive of palaeontological samples and other records is assembled to characterize the palaeontological occurrences affected by the excavation operation.

2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas.

3. Facilitate systematic recording of the stratigraphic and palaeo-environmental features in exposures in the fossil-bearing excavations, by described and measured geological sections, and by providing aid in the surveying of positions where significant fossils are found.

4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.

5. Provide covered, dry storage for samples and facilities for a work area for sorting, labeling and boxing/bagging samples.

6. Costs of basic curation and storage until collected. Documentary record of palaeontological occurrences must be done.

7. The contractor will, in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which appropriate information regarding plans for excavations and work schedules must be indicated on the plan of the excavation sites. This must be done in conjunction with the appointed specialist.

8. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

9. Locations of samples and measured sections are to be pegged, and routinely and accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any “significant fossils” are recorded during the time of excavation.

## 5. CONCLUSIONS & RECOMMENDATIONS

The proposed development is on rock which could be fossiliferous. However, the rock is weathered and the site is highly disturbed. It is unlikely that **Palaeontological Material** will be discovered on a pre-excavation field trip as the rock is highly weathered and fresh rock is not exposed.

A **Chance Find Protocol** has been inserted. Should any **Palaeontological Material** be uncovered a Palaeontologist must be called in to investigate.

Should excavations >2m deep take place and expose fresh rock, a field visit by a competent Palaeontologist should be arranged.

## 6. REFERENCES

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## 7. DETAILS OF SPECIALIST

### Dr Alan Smith

**Private Consultant:** Alan Smith Consulting, 29 Brown's Grove, Sherwood, Durban, 4091

&

**Honorary Research Fellow:** Discipline of Geology, School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban.

**Role:** Specialist Palaeontological Report production

### **Expertise of the specialist:**

- PhD in Geology (University of KwaZulu-Natal), Pr. Sc. Nat., I.A.H.S.
- Expert in Vryheid Formation (Ecca Group) in northern KZN, this having been the subject of PhD.
- Scientific Research experience includes: Fluvial geomorphology, palaeoflood hydrology, Cretaceous deposits.
- Experience includes understanding Earth Surface Processes in both fluvial and coastal environments (modern & ancient).
- Alan has published in both national and international, peer-reviewed journals. He has published more than 50 journal articles with 360 citations (detailed CV available on request).
- Attended and presented scientific papers and posters at numerous international and local conferences (UK, Canada, South Africa) and is actively involved in research.

Selected recent palaeo-related work includes:

- Desktop PIA: Proposed middle income housing units on Portion 23 of Farm Lot H Weston 13026, Bruntville, Mpofana Local Municipality. Client: UMLANDO.
- Desktop PIA: Proposed ByPass Pipeline for Ulundi bulk water pipeline upgrade. Client: UMLANDO.

- Fieldwork PIA: Bhekuzulu Epangweni KZN water reticulation project, Cathkin Park. Client: Mike Webster, HSG Attorneys.
- Desktop PIA: Zuka valley, Ballito. Client: Mike Webster, HSG Attorneys.
- Mevamhlope proposed quarry palaeontology report. Client: Enviropro.
- Desktop PIA: Proposed Lovu Desalination site. Client: eThembeni Cultural Heritage.
- Desktop PIA: Tinley Manor phase 2 North & South banks: eThembeni Cultural Heritage
- Desktop PIA: Tongaat. Client: eThembeni Cultural Heritage.
- Palaeontological Assessment Reports (3) to Scatec Solar SA (Pty) Ltd on an Appraisal of Inferred Palaeontological Sensitivity for a Potential Photo Voltaic Park at (1) Farm Rooilyf near Groblershoop, N Cape; (2) Farm Riet Fountain No. Portions 1 and 6, 18km SE of De Aar, N Cape; and (3) Dreunberg, near Burgersdorp, Eastern Cape. Client: Sustainable Development Projects.