

**HIA FOR THE SAMPOFU SUPPLY REGIONAL
WATER SUPPLY SCHEME, PHASE 2, KZN.**

FOR CIVTECH ENGINEERS (PTY) LTD

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EXECUTIVE SUMMARY

Phase 2 of Sampofu Regional Bulk Water Supply will be a component of the regional water supply scheme. The design of the original project area water supply infrastructure was on a low unit demand of 25ℓ/capita/day or less.

The client wishes to improve a water infrastructure to address the problems experienced by the community, some of which are discussed below:

- • Existing bulk infrastructures are of insufficient capacity to provide in the nominal demand of 25ℓ/c/d.*
- • The communities are without a continuous water supply or are without water for a prolonged period of time.*
- • The design philosophy adopted to supply the project area is uneconomical. Connections are affected directly from a pumping line and bypassing off the storage reservoir.*
- • According to the operations and maintenance personnel, only 30% of communities receive water from the system.*

A heritage survey was undertaken for the proposed Sampofu water reticulation project. Previous surveys noted that there were many human graves and cemeteries in the general area. A total of sixty-one (61) graves and thirty-five (35) cemeteries were recorded, as well as one memorial and terracing for a settlement. Several of these graves and cemeteries occur within 20m of the pipeline footprint. The pipeline will need to be re-aligned in some of these instances pending on the size of the footprint. The final layout needs to be approved by the heritage practitioner. To ensure graves are not affected.

No further palaeontological mitigation is required.

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Abbreviations

HP	Historical Period
IIA	Indeterminate Iron Age
LIA	Late Iron Age
EIA	Early Iron Age
ISA	Indeterminate Stone Age
ESA	Early Stone Age
MSA	Middle Stone Age
LSA	Late Stone Age
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

INTRODUCTION

The project is located approximately 40km north of Greytown within the Town of Tugela Ferry. The town is situated adjacent to the Tugela River bridge crossing with approximate coordinates of S28°43'43"; E30°21'47".

The project area for Sampofu Phase 2, as derived from the regional planning, effectively encompasses portions of Ward 5, and a small portion of Ward 7 of uMsinga Local Municipality, incorporating various sub wards as well as the Tugela Ferry town. uMsinga LM falls with the Umzinyathi District Municipality (District Code DC24). The project area is predominantly within Ebathenjini Tribal Authority, with the source located within Ward 4.

The most recent Sampofu Regional planning study dated 2 March 2021 for water supply to the project area denoted this project area as Supply Zone 34. The regional planning also provides information on the demographics, source of water and existing infrastructure as well as the proposed water supply strategy.

Phase 2 of Sampofu Regional Bulk Water Supply will be a component of the regional water supply scheme. The design of the original project area water supply infrastructure was on a low unit demand of 25l/capita/day or less.

The client wishes to improve a water infrastructure to address the problems experienced by the community. These are as follows:

- Existing bulk infrastructures are of insufficient capacity to provide in the nominal demand of 25l/c/d.
- The communities are without a continuous water supply or are without water for a prolonged period of time.
- The design philosophy adopted to supply the project area is uneconomical. Connections are affected directly from a pumping line and bypassing off the storage reservoir.

- According to the operations and maintenance personnel, only 30% of communities receive water from the system.

Reticulation has been designed to allow for metered yard connection to each house. This standard of source will limit water loss from stand pipes which is poorly controlled. The reticulation pipes to be installed varies from 20 to 315 mm diameter.

According to the design plan the pipelines will be excavated with a maximum of 1m footprint on the road reserve. Excavations will be manually undertaken in soft sand, while excavators will be used on hard rock.

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

FIG. 1 GENERAL LOCATION OF THE PROPOSED DEVELOPMENT

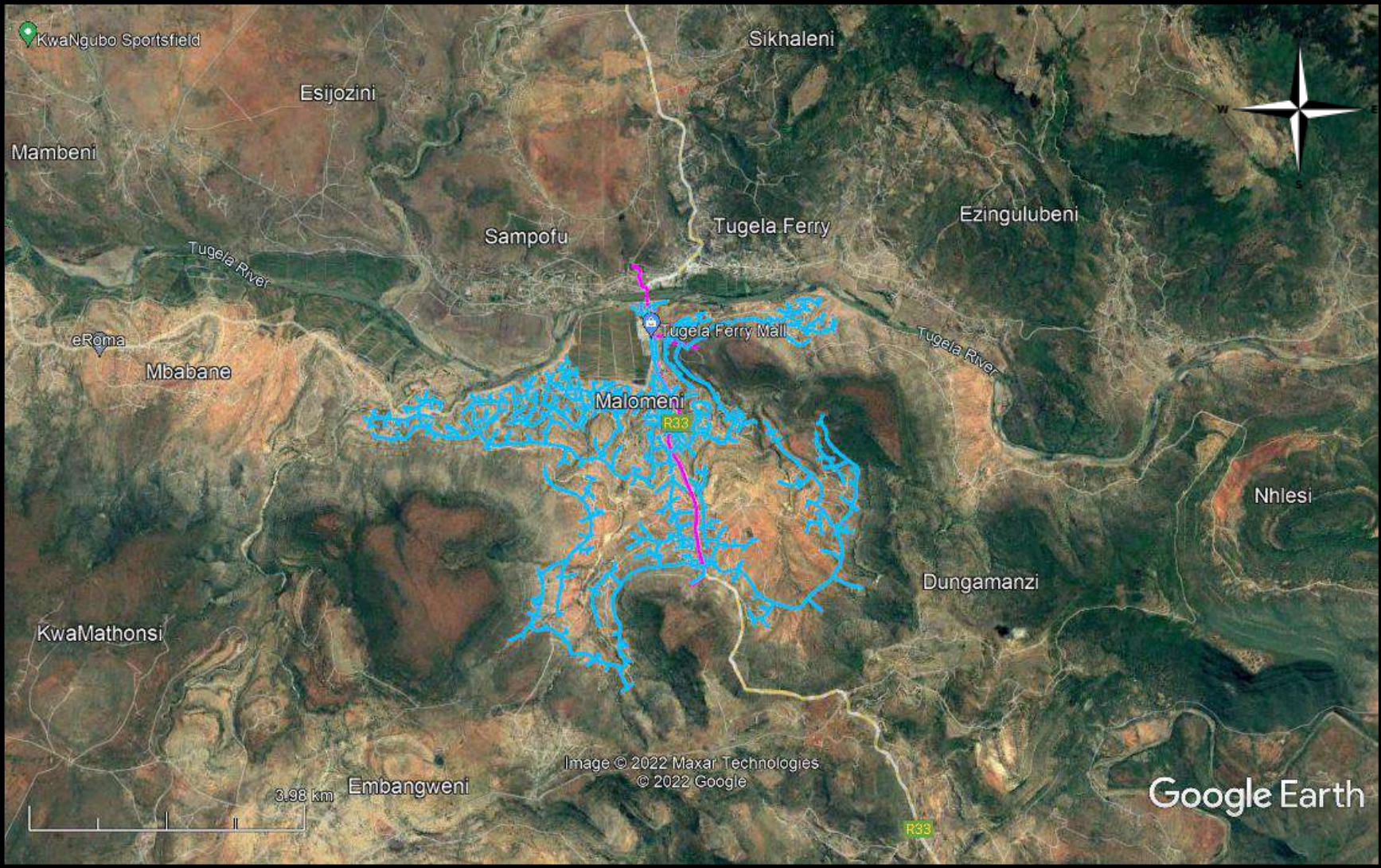


FIG. 2: AERIAL OVERVIEW OF THE PROPOSED DEVELOPMENT

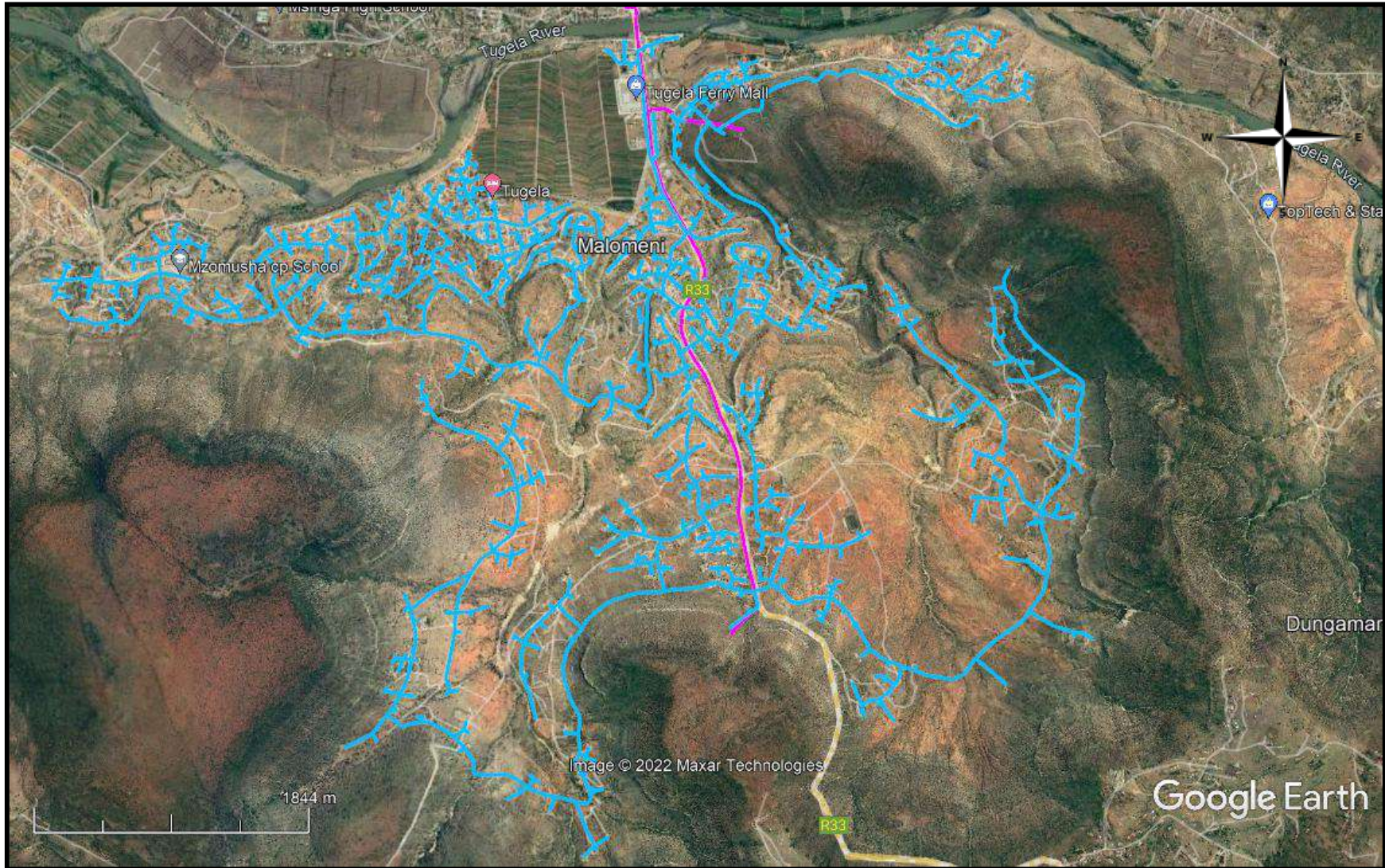


FIG. 4: SCENIC VIEWS OF THE STUDY AREA



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 1st and 2nd 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. iddens
- 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. Few archaeological sites occur in the general area. This is due to a lack of surveys, rather than an indication of the amount of sites in the area. The known sites are Stone Age and Iron Age sites. Some historical buildings do exist in the general area (fig. 5). Anderson (2014a-b) and Prins (2019) undertook surveys in adjacent Wards. Anderson noted many 20th century graves alongside the various roads. Prins noted no heritage sites, but did caution for subsurface graves.

Using the historical maps to locate the occurrence of human settlements, or houses, is important. These older houses are in rural areas where traditional burial practices would be undertaken. This means that a Nguni-speaking settlement pattern will exist where graves will occur on the outskirts of the house, normally on the opposite side of the cattle byre. The graves can be 20m – 60m from the main house, or *indlu enkulu*. It is for this reason why a 50m – 100m sensitivity radius around the houses from the maps is needed.

The 1937 aerial photograph indicates that there area is sparsely populated (fig. 6). Many of these houses are in the upper slopes above the current pipeline.

The 1948 topographical map indicates that there are settlements in the general area (fig. 7). When comparing these settlements to modern aerial imagery, it appears that many of the sites have been repeatedly occupied since the 1930s, if not earlier. The locations of the 1948 sites are given in Table 2.

TABLE 2: LOCATION OF SETTLEMENTS & BUILDINGS IN 1948

Name	Latitude	Longitude	Desc
	-28.756108423	30.463383742	House x2
b1	-28.763180653	30.431685952	
b2	-28.763645462	30.435526665	Building
b3	-28.763974815	30.443743087	Building
b4	-28.763457213	30.444816622	Buildings and tennis court
b5	-28.752458154	30.443439406	Buildings. S.A.S Bus terminal
C1	-28.764535782	30.416614662	Lutheran Church
D1	-28.779706960	30.438713550	Dip
h1	-28.769680909	30.401594453	house & kraal to east
h10	-28.767947919	30.423247213	House
h11	-28.769596366	30.423864702	House
h12	-28.775557815	30.426690028	House
h13	-28.775508909	30.427300637	House
h14	-28.763371491	30.438378575	House
h15	-28.766123465	30.437616965	House, ktaal to the SE
h16	-28.790266315	30.425756862	House, kraal to the W
h17	-28.793001131	30.425845447	House
h18	-28.793352724	30.425938293	House
h19	-28.793228715	30.424393829	House
h2	-28.767865157	30.402286384	House/hut
h20	-28.793645062	30.424305954	House
h21	-28.793833852	30.425117984	House
h22	-28.794447302	30.425011520	House, kraal to the W
h23	-28.797276701	30.433676940	House
h24	-28.765630448	30.443624323	House
h25	-28.766868465	30.443912935	House
h26	-28.767366900	30.442413626	House
h27	-28.768500315	30.444516615	House
h28	-28.769831442	30.444776128	House
h29	-28.796210815	30.445099510	House
h3	-28.768957483	30.403199106	House/hut
h30	-28.798459517	30.440097331	House
h31	-28.789934487	30.437622784	House x3
h32	-28.787881621	30.437568220	House x2
h33	-28.787460810	30.437764398	House
h34	-28.788750560	30.437783098	House
h35	-28.786352492	30.441046208	House x5
h36	-28.784657397	30.441976394	House x2
h37	-28.785205750	30.442505977	House x2
h38	-28.784548605	30.443562022	House x2
h39	-28.784028251	30.445515555	House x2
h4	-28.769383816	30.412433976	2x housess

h40	-28.785140564	30.444972643	House
h41	-28.785442747	30.446706815	House
h42	-28.786491878	30.448430784	House
h43	-28.786292361	30.449879148	House
h44	-28.787179533	30.449848909	House
h45	-28.755856726	30.449855043	House x2
h46	-28.754699084	30.450941618	House
h47	-28.754125676	30.452548275	House x2
h48	-28.753667596	30.454109104	House
h49	-28.753832000	30.461117246	House x3
h5	-28.768110236	30.414893571	House
h50	-28.753534243	30.463331247	House
h51	-28.754130737	30.463216061	House
h52	-28.754615898	30.464518531	House x2
h53	-28.754787244	30.468303060	House x2
h54	-28.755647189	30.467363108	House
h56	-28.759738276	30.447375295	House x2
h57	-28.761156624	30.449659629	House
h58	-28.766310469	30.450661863	House
h59	-28.766109751	30.454214399	House
h6	-28.768598922	30.415075875	House
h60	-28.766766697	30.454364060	House x2
h61	-28.767262085	30.454552999	House
h62	-28.766535273	30.456448866	House x3
h63	-28.767328615	30.458635743	House x2
h64	-28.767485845	30.460117105	House
h65	-28.768124118	30.459011320	House
h66	-28.769564702	30.446991366	House
h67	-28.770683733	30.445909743	House
h68	-28.771298495	30.447102451	House
h69	-28.771694362	30.447191270	House
h7	-28.768244017	30.418500720	House
h70	-28.771280008	30.463550506	House x2
h71	-28.768984201	30.471223457	House
h72	-28.771754818	30.470439014	House
h73	-28.773505432	30.471078835	House x2
h74	-28.775001177	30.472507357	House
h75	-28.774034144	30.450070410	House
h76	-28.783382078	30.451534562	House
h77	-28.785543625	30.451191668	House
h78	-28.784835393	30.453652679	House x2
h79	-28.786117652	30.454444577	House, kraal to the S
h8	-28.769730475	30.421051657	House
h80	-28.777420529	30.473760145	House x3
h81	-28.778687717	30.473081561	House x4
h82	-28.781119827	30.472522458	House
h83	-28.781803697	30.472297174	House
h84	-28.782453963	30.472867312	House
h85	-28.785355105	30.470636527	House x5
h86	-28.793541482	30.469589269	House

h87	-28.793861171	30.469024508	House
h88	-28.789838474	30.472241530	House x2
h89	-28.790303469	30.474075861	House x2
h9	-28.769957065	30.420542665	House
K1	-28.766968564	30.426065646	Kraal
k2	-28.770302292	30.436831417	Kraal
k3	-28.799764123	30.433051893	Kraal
k4	-28.795587061	30.436828294	Kraal
k5	-28.775011740	30.445727524	Kraal
k6	-28.776921928	30.448250475	Kraal
S1	-28.766231845	30.408801421	Mzomusha School
s2	-28.763330534	30.440028993	School

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

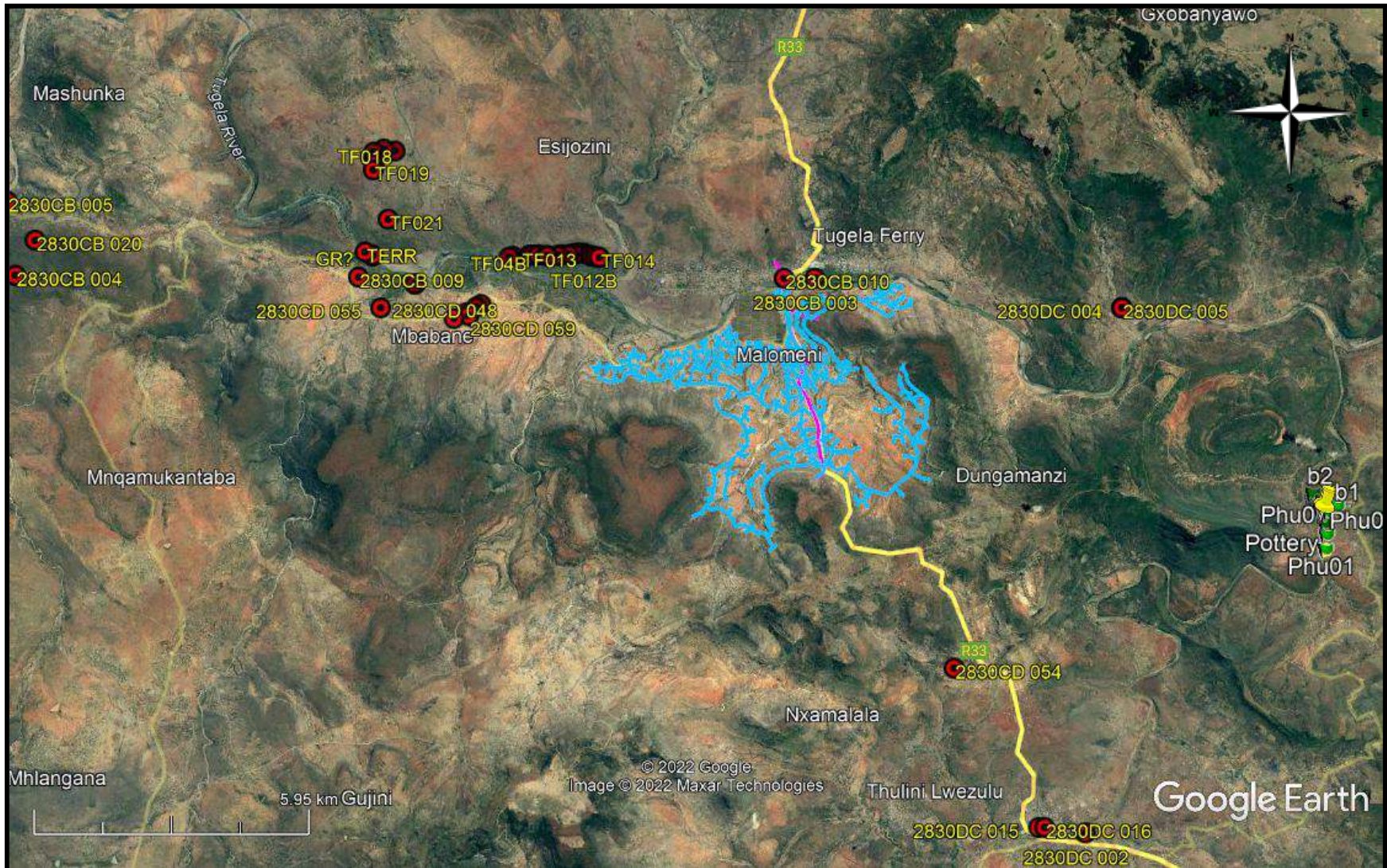


FIG. 6: LOCATION OF THE STUDY AREA IN 1937

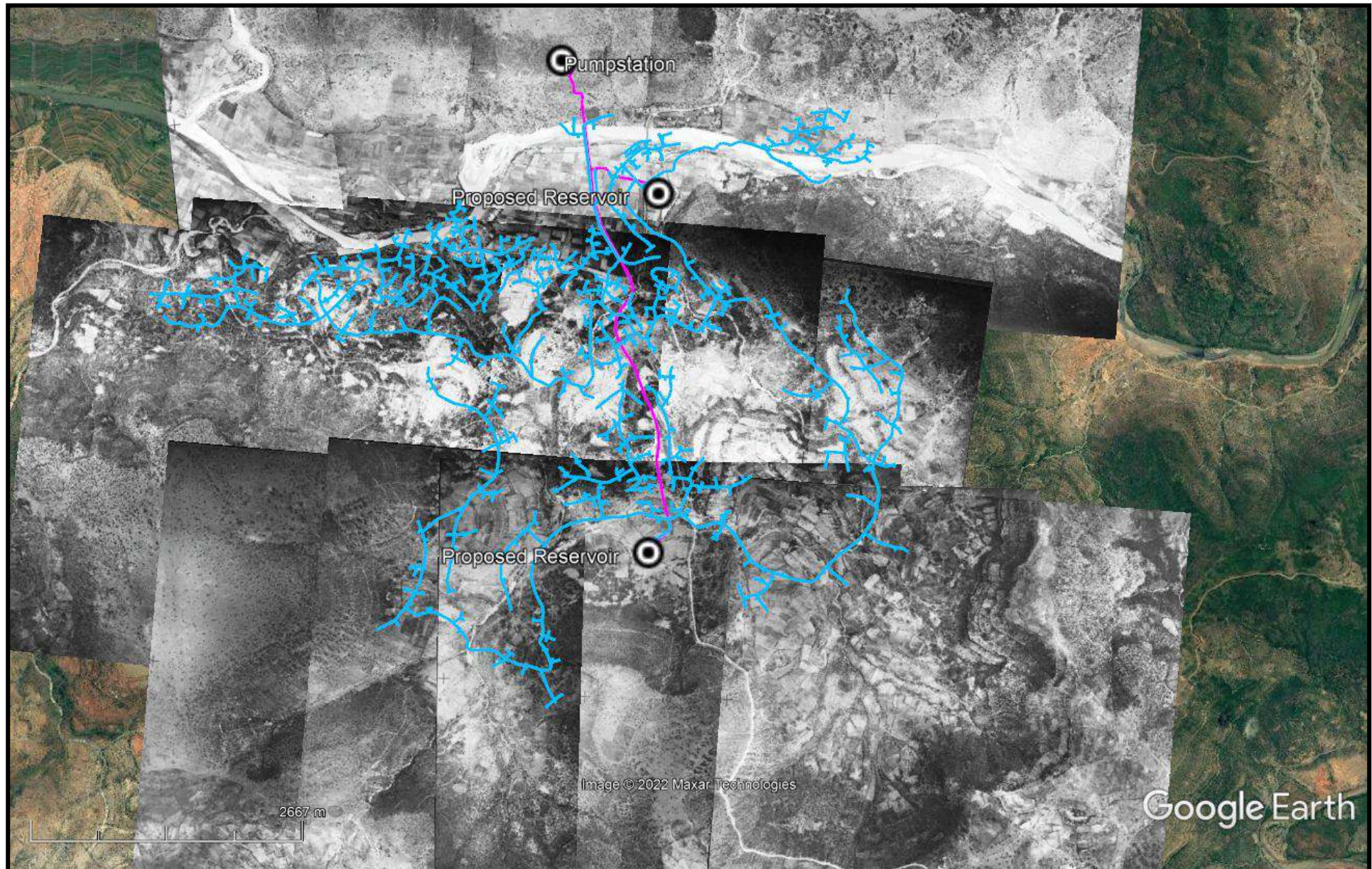
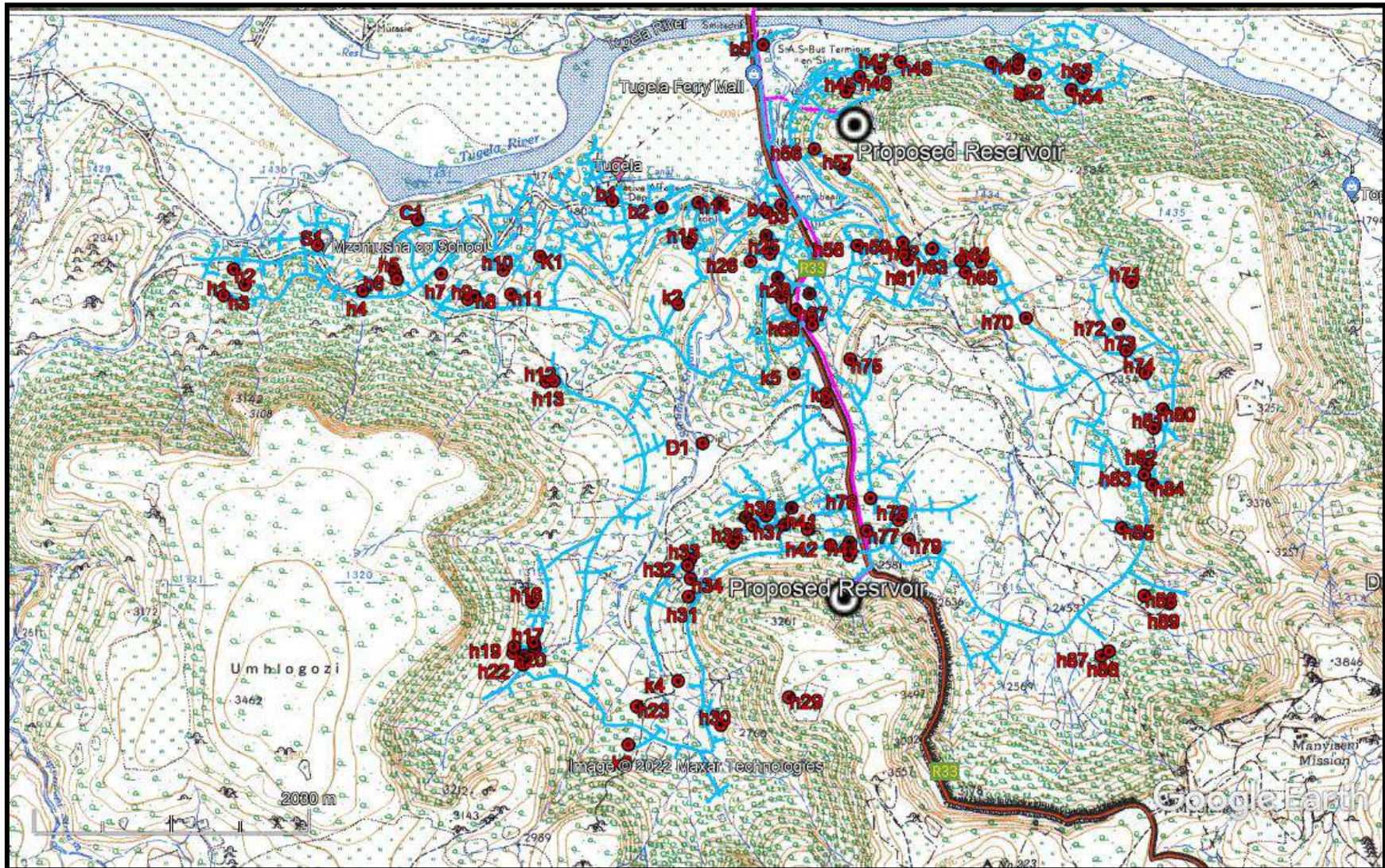


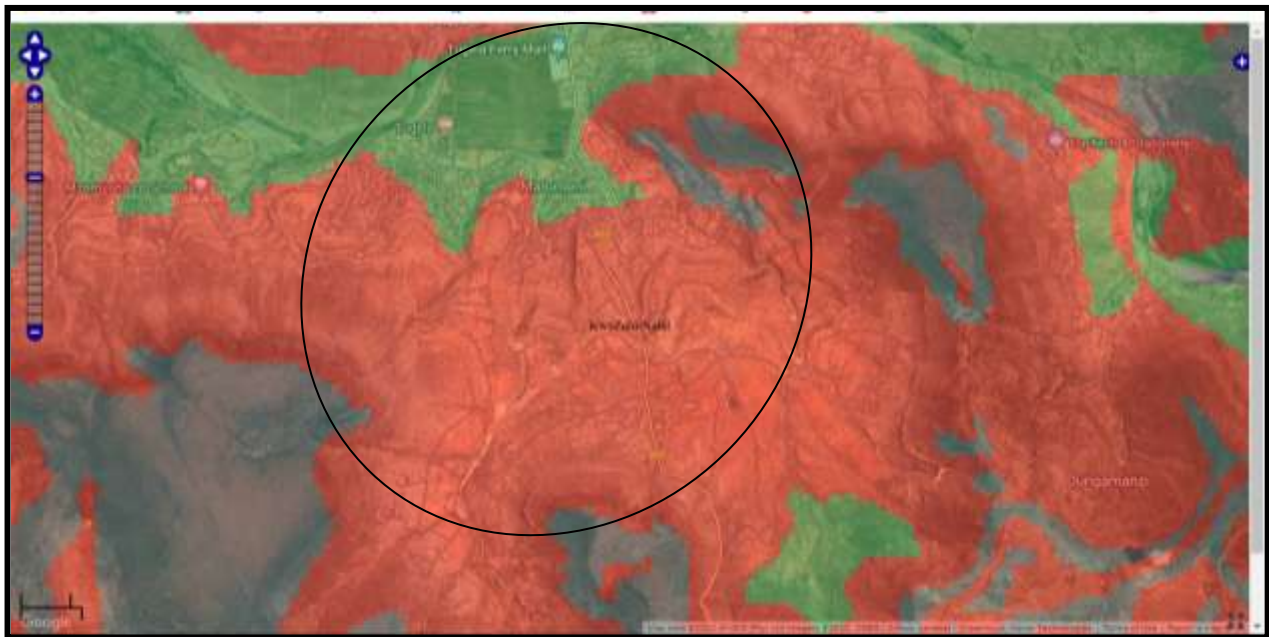
FIG. 7: LOCATION OF THE STUDY AREA IN 1948



PALAEONTOLOGICAL SENSITIVITY

The area is in an area of zero to low palaeontological sensitivity (fig. 8). Dr Alan Smith undertook the desktop PIA survey (Appendix A). He states:” The chance of fossils being found on the Sampfu Water Reticulation Pipeline site is **Low**, but not **Zero**. A **“Chance Find Protocol”** has been included... to cover this eventuality. No further palaeontological work is required, unless triggered by the **“Chance Find Protocol”** in which a suitably qualified palaeontologist must be consulted. The **“Chance Find Protocol”** must form part of the Environmental Management Programme (EMPr) for the site.”

FIG. 8: PALAEONTOLOGICAL SENSITIVITY MAP



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.

FIELD SURVEY

A field survey was undertaken from 17 – 19 May 2022. Ground visibility was very good due to the dry environment of the area. Most of the pipeline was covered; however, some of the upper lines were inaccessible and were omitted. These areas would have smaller diameter pipes direct to individual houses and will not have an impact.

Graves within individual households, and if fenced, were omitted from the analyses, unless a pipeline went directly through the grave. This was for logistical and practical reasons. Many contemporary settlements have graves that are already fenced off, or demarcated. The residents know about the graves and would not allow them to be affected by the pipelines. Since these are small diameter pipes, they can be adjusted *in situ* if needs be.

There are two groupings to the graves:

1. 'Graves' refers to an area with 1 – 6 graves
2. 'Cemetery' refers to an area with more than 6 graves.

A total of sixty-one (61) graves and thirty-five (35) cemeteries were recorded, as well as one memorial and terracing for a settlement. For the sake of brevity, this has been summarised in Table 3, otherwise the report would be an additional 100 pages of photographs and a few sentences. Table 3 notes which areas occur within 20m of the pipeline and are highlighted in red.

Significance: All human graves are of high significance and may not be affected by developments unless a specific process has been undertaken.

Mitigation: All cemeteries and graves need to have a 20m buffer from the edge of the grave/cemetery. This could be reduced to 10m for certain areas. In some cases this may be difficult as the cemetery can be on both sides of the road or servitude, if not on the edge of the road. This occurs at CEM04, CEM016, CEM021, CEM025, CEM029, CEM031, and CEM032. In these cases, the

pipeline must stay as close to the road as possible, or be re-aligned away from the cemetery.

Where the road is a natural buffer from a grave, then the 20m buffer can be omitted. Similarly, if the grave/cemetery is fenced off, then the buffer can be omitted, as the reticulation footprint should not be entering this area.

Any pipelines that need to be placed closer than 10m to a grave/cemetery, needs to be re-assessed at a desktop level. The type of pipeline and its footprint will need to be known.

Reticulation pipes to be installed along the residential areas varies from 20mm to 315mm diameter. The smaller pipes will have limited, or no, affect on graves and cemeteries. If the excavations are manual, then a 5m – 10m buffer from the grave should be allowed. If the excavations will be mechanical, then a 20m buffer will be required and parts of the route will need to be re-aligned.

MEMORIAL

The memorial is for thirteen people who were killed by a truck who lost control at that location. The memorial might be affected by the pipeline; however this depends on the footprint of the pipeline.

Significance: The memorial has high local significance.

Mitigation: The memorial could be temporarily moved and returned after construction; however this should be a last resort. If it is to be moved, then the relevant municipality will need to be approached.



TERRRACING

One area showed signs of terracing. This is normally associated with houses and graves. No house floors or graves were noted in this area, but they could be subsurface.



Significance: The terracing is of low significance.




Mitigation: No mitigation is currently required.




TABLE 3: SUMMARY OF RECORDED GRAVES AND CEMETERIES





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR01	28°45'10.22"S	30°28'10.89"E	x 2	No	
GR02	28°45'11.41"S	30°28'10.62"E	x 2	No	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR03	28°45'3.29"S	30°28'0.47"E	x 5	No	
GR04	28°45'7.05"S	30°27'51.27"E	x 2	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR05	28°45'11.10"S	30°27'53.42"E	x 1	Yes	
GR06	28°45'13.18"S	30°27'0.78"E	x 5+	No	
GR07	28°45'14.38"S	30°26'56.33"E	x 2+	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR08	28°46'52.62"S	30°27'9.86"E	x 5	Yes	
GR09	28°45'25.85"S	30°26'44.17"E	x 1	Yes, but already demarcated	
GR10	28°45'36.33"S	30°26'46.60"E	x 1	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR11	28°45'38.42"S	30°26'48.64"E	x 1	Yes	
GR12	28°45'42.53"S	30°25'49.41"E	x 1	Yes	
GR13	Does not exist				
GR14	Does not exist				
GR15	28°45'54.82"S	30°25'36.65"E	X 5	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR16	28°45'53.96"S	30°25'17.50"E	x 2+	No	
GR17	28°45'52.53"S	30°25'20.21"E	x 3	Yes	
GR18	28°45'58.92"S	30°24'52.09"E	x 2	Yes	
GR19	28°46'8.59"S	30°24'46.84"E	x 4	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR20	28°46'15.79"S	30°26'9.92"E	x 2	Yes	
GR21	28°46'16.96"S	30°26'9.35"E	x 4+	Yes	
GR22	28°46'19.51"S	30°26'10.40"E	?	Yes	
GR23	28°46'22.73"S	30°26'6.11"E	x 1	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR24	28°46'49.59"S	30°26'7.16"E	x 1	Yes	
GR25	28°46'59.76"S	30°26'5.04"E	x 4	No	
GR26	28°47'15.87"S	30°25'45.50"E	?	No	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR27	28°47'31.59"S	30°25'38.34"E	?	No	
GR28	28°47'31.08"S	30°25'33.49"E	x 1+	Yes	
GR29	28°48'10.24"S	30°26'23.82"E	x 1	Yes	
GR30	28°47'52.82"S	30°26'18.93"E	x 1+	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR31	28°47'50.76"S	30°26'19.66"E	x 4+	No	
GR32	28°47'49.17"S	30°26'20.38"E	x 3+	No	
GR33	28°47'48.68"S	30°26'2.29"E	x 1	No	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR34	28°46'16.56"S	30°26'54.80"E	x 1	Yes	
GR35	Does not exist				
GR36	28°47'18.63"S	30°26'14.95"E	x 3+	Yes	
GR37	28°47'15.97"S	30°26'16.02"E	x 3+	No	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR38	28°47'7.92"S	30°26'23.61"E	x 3+	No	
GR39	28°47'8.90"S	30°26'24.53"E	?	No	No photo
GR40	28°48'9.91"S	30°26'22.63"E	x 3	Yes	
GR41	28°47'1.03"S	30°26'35.89"E	x 1	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR42	28°47'3.21"S	30°26'40.44"E	x 1	Yes	
GR43	28°47'3.70"S	30°26'41.11"E	x 3	Yes	
GR44	28°47'6.21"S	30°26'41.98"E	x 1+	No	
GR45	28°46'59.95"S	30°26'48.83"E	x 1	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR46	28°46'56.07"S	30°26'52.63"E	x 1	No	
GR47	28°46'54.22"S	30°27'2.97"E	?	Yes	
GR48	28°47'29.45"S	30°27'38.56"E	x 2	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR49	28°47'32.82"S	30°27'42.18"E	x 1	Yes	
GR50	28°46'49.18"S	30°28'1.46"E	x 1	No	
GR51	28°46'53.19"S	30°28'15.81"E	x 1	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR52	28°46'55.03"S	30°28'19.94"E	x 1	No	
GR53	28°46'55.62"S	30°28'21.42"E	x 1	Yes	
GR54	28°46'40.84"S	30°28'20.89"E	x 2	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR55	28°46'47.02"S	30°26'55.11"E	x 1	Yes	
GR56	28°46'47.75"S	30°26'52.37"E	x 1	Yes	
GR57	28°46'5.11"S	30°27'27.57"E	x 1+	No	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR58	28°46'29.06"S	30°26'47.87"E	x 3	Yes	
GR59	28°45'52.20"S	30°26'34.95"E	x 3	Yes	
GR60	28°45'46.91"S	30°26'59.25"E	x 1	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
GR61	28°45'52.45"S	30°26'27.27"E	x 2	Yes	
GR62	28°46'29.49"S	30°26'5.95"E	x 3+	No	
GR63	28°45'54.46"S	30°25'1.94"E	x 1	Yes	





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM01	28°45'14.00"S	30°28'8.54"E	x 5+	Yes	
CEM02	28°45'17.68"S	30°28'2.94"E	x 5+	Yes	
CEM03	28°45'7.00"S	30°27'53.25"E	x 5+	No	
CEM04	28°45'12.34"S	30°27'51.14"E	x 5+	Yes	
CEM05	28°45'15.58"S	30°27'2.73"E	?	Yes	No photo





Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM06	28°45'16.72"S	30°26'59.31"E	x 5+	Yes	
CEM07	28°45'19.20"S	30°26'45.91"E	x 5+	No	
CEM08	28°45'24.68"S	30°26'44.80"E	x 5+	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM09	28°45'43.95"S	30°26'53.48"E	x 5+	Yes	
CEM10	28°45'50.10"S	30°26'36.47"E	x 3	Yes	
CEM11	28°45'55.12"S	30°26'30.34"E	x 5+	Yes	
CEM12	28°45'49.24"S	30°26'30.80"E	x 5+	Yes	




Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM13	28°45'47.46"S	30°26'21.82"E	x 5+	No	
CEM14	28°45'47.22"S	30°26'19.39"E	x 4+	Yes	
CEM15	28°45'49.15"S	30°25'16.72"E	x 4+	No	
CEM16	28°45'54.93"S	30°25'11.97"E	x 5+	Yes	



Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM17	28°45'59.51"S	30°24'57.41"E	x 5+	No	
CEM18	28°46'2.36"S	30°24'56.91"E	x 5+	No	
CEM19	28°46'3.39"S	30°24'50.67"E	x 3+	Yes	
CEM20	28°46'4.94"S	30°24'49.39"E	x 5+	Yes	

Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM21	28°46'7.80"S	30°24'48.30"E	x 5+	Yes	
CEM22	28°46'28.40"S	30°26'2.18"E	x 15+	No	
CEM23	28°47'3.32"S	30°26'34.47"E	x 8	No	
CEM24	28°47'2.23"S	30°26'38.56"E	?	Yes	

Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM25	28°46'56.31"S	30°27'14.26"E	?	Yes	
CEM26	28°46'57.51"S	30°28'22.41"E	?	No	
CEM27	28°46'50.44"S	30°28'18.53"E	?	No	No photo
CEM28	28°46'48.19"S	30°28'20.33"E	x 5+	No	
CEM29	28°46'15.07"S	30°26'56.83"E	x 5+	Yes	

Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM30	28°46'0.96"S	30°27'13.35"E	x 5+	No	
CEM31	28°46'1.31"S	30°27'21.70"E	x 5+	Yes	
CEM32	28°46'3.23"S	30°27'23.41"E	?	Yes	

Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
CEM33	28°46'0.47"S	30°26'17.91"E	x 7+	Yes	
CEM34	28°47'51.25"S	30°26'14.34"E	x 1	No	
CEM35	28°46'15.00"S	30°26'11.95"E	x 5+	Yes	

Name	Latitude	Longitude	Brief Description	Within 20m of the Pipeline	Image
Memorial	28°45'41.62"S	30°26'41.07"E	Memorial to 13 people who died due to a truck accident	Yes	
Terracing	28°47'20.59"S	30°26'8.50"E	Terracing: may have subsided/older graves	Yes	

RECOMMENDATIONS

All cemeteries and graves need to have a 20m buffer from the edge of the grave/cemetery. This could be reduced to 10m for certain areas and should be treated on a case-by-case basis. In some instances the 10m buffer may be difficult, as a cemetery can be on both sides of the road or servitude, if not on the edge of the road. This occurs at CEM04, CEM016, CEM021, CEM025, CEM029, CEM031, and CEM032. In these cases, the pipeline must stay as close to the road as possible, or be re-aligned away from the cemetery. With the 1m footprint, the excavations must occur on the road itself and not towards the

cemetery/graves. In these areas the graves/cemetery need to be clearly demarcated, preferably with high visibility netting.

Where the road is a natural buffer from a grave, then the 20m buffer can be omitted. Similarly, if the grave/cemetery is fenced off, then the buffer can be omitted, as the reticulation footprint should not be entering this area.

Any pipelines that need to be placed closer than 10m to a grave/cemetery, needs to be re-assessed at a desktop level. The type of pipeline and its footprint will need to be known.

Any excavations in the 'Hard Rock' area will need to be re-aligned away from the graves/cemetery, preferably to the opposite side of the road. This is to counter potential incidents with the HME and graves.

Final route alignment should be approved by the heritage practitioner.

CONCLUSION

A heritage survey was undertaken for the proposed Sampofu water reticulation project. Previous surveys noted that there were many human graves and cemeteries in the general area. A total of sixty-one (61) graves and thirty-five (35) cemeteries were recorded, as well as one memorial and terracing for a settlement. Several of these graves and cemeteries occur within 20m of the pipeline footprint. The pipeline will need to be re-aligned in some of these instances pending on the size of the footprint. The final layout needs to be approved by the heritage practitioner to ensure graves are not affected.

No further palaeontological mitigation is required.

REFERENCES

Anderson, G. 2014a. Cultural Heritage Impact Assessment of the Masunka Ngubo Community Access Road and Bridge, Sampofu Local Municipality. Umlando. Unpublished report for Afzelia.

Anderson, G. 2014b. Mashunka And Ngubo Community Access Road And Bridge, Tugela Ferry, KwazuluNatal For Afzelia Environmental Consultants

Prins, F. 2019. Phase One Heritage Impact Assessment Of The Proposed Kwa Kopi Water Works, Sampofu Local And Mzinyathi Regional Municipalities, KZN. For EnviroPro.

1:50 000 Topographical Maps

2830CB 1965, 2000

2830CD 1948, 1971

Aerial Photographs

152_18_75436 - 75442

152_19_75820 - 75827

152_20_75402 - 75408

Database

KZN Museum

SHARIS

Umlando

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
DESKTOP PIA

**SAMPOFU WATER RETICULATION
SYSTEM: DESKTOP PALEONTOLOGICAL
ASSESSMENT TUGELA FERRY, SAMPOFU
LOCAL MUNICIPALITY,
KWAZULU-NATAL**

FOR

**UMLANDO: Archaeological Surveys & Heritage Management
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by

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Telephone: 031 208 6896
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18 May, 2022

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

Alan Smith Consulting was appointed by **UMLANDO: Archaeological Surveys & Heritage Management** to conduct a Desk-Top field assessment of the potential impacts to **Palaeontology Resources** that might occur through the activities of the proposed Sampofu Water Reticulation Pipelines, Tugela Ferry, Sampofu Local Municipality, KwaZulu-Natal

Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), requires a Palaeontological Impact Assessment (PIA) to assess any potential impacts to palaeontological heritage.

The chances of encountering fossils are **Low, but Not Zero**; consequently a “*Chance Find Protocol*” has been included.

ACRONYMS

BA:	Basic Assessment
EDTEA:	(Department of) Economic Development, Tourism and Environmental Affairs
HIA:	Heritage Impact Assessment
PIA;	Palaeontological Impact Assessment
SAHRA:	South African Heritage Resource Agency
SAHRIS:	South African Heritage Resources Information System

1. TERMS OF REFERENCE

Alan Smith Consulting was requested by **UMLANDO: Archaeological Surveys & Heritage Management** to provide a Desk-Top Palaeo Impact Assessment for the proposed Sampofu Water Pipeline development (Figure 1). This report is to meet the requirements of the National Environmental Management Act (Act 107 of 1998) [as amended] Environmental Impact Assessment (EIA) regulations, Appendix 6.

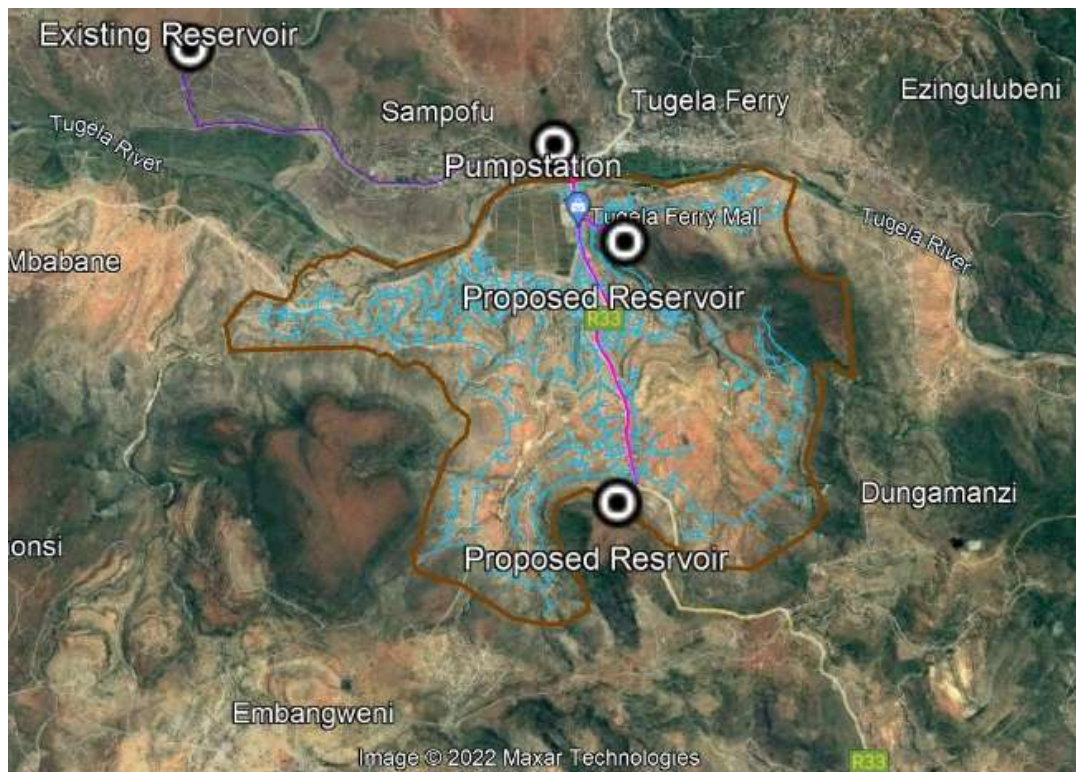


Figure 1: Location of the proposed Sampofu Water Pipeline project.

2. SCOPE AND PURPOSE OF REPORT

A Palaeontological Impact Assessment (PIA) is a means of identifying any significant palaeontological material before development begins, so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This Desk-Top investigation fulfills the requirements of the heritage authorities (SAHRA), such that a comment can be issued by them for consideration by the competent authority (EDTEA), who will review the Basic

Assessment (BA) and grant or refuse authorisation. The PIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation, should this be granted.

3. METHODOLOGY

Geological maps, a literature review and personal experience (see Section 10) were used in this research.

4. GEOLOGY

Alluvium (yellow), Volksrust Formation, (orange), Vryheid Formation (Pv: light brown) and Karoo Dolerite (Jd: red) may be present on this site (Figure 2).

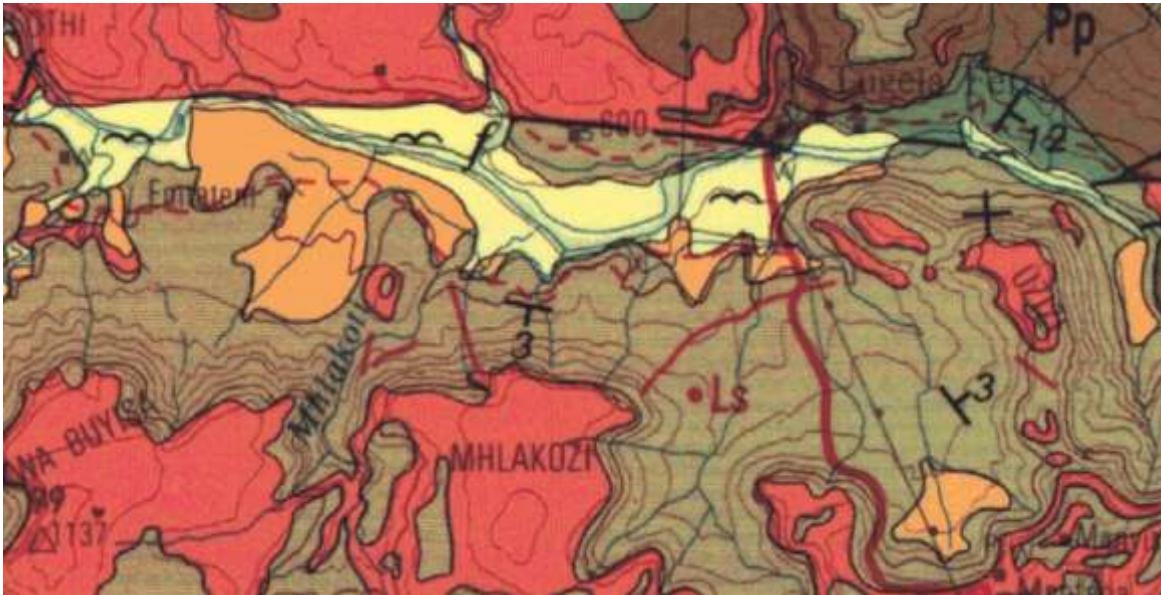


Figure 2: Approximate area of the Sampofu Water Pipeline project. Extract from the 1:25 000 Geological Map: Dundee 2830. According to this map, the Sampofu Water Reticulation project will intersect Alluvium (yellow), Volksrust Formation, (orange), Vryheid Formation (Pv: light brown) and Karoo Dolerite (Jd: red).

Alluvium

Alluvium comprises Quaternary sediments. These comprise alluvium (river deposits) and colluvium (hill slope deposits). This sediment has been eroded from the country rocks and deposited by the Tugela River in the channel and floodplain.

Volksrust Formation

The Volksrust Formation is Late Permian in age (Cairncross et al. 2005). Typically, it comprises a blue-black shale (Figure 3). This unit was deposited in generally non-marine conditions (Cataneneau et al., 1998), but pockets of marine conditions were present (Cairncross et al., 2005).



Figure 3: Example of the Volksrust Formation. This lithology is typically a blue shale and very weathered.

Vryheid Formation

The Permian aged Vryheid Formation (Kungurian Stage – 260million years old (Ma: Green and Smith, 2012) comprises predominantly coarse-grained sandstone and siltstones, interbedded by dark shales and coal beds. The Formation is interpreted as “near-shore sandbars” and deltaic deposits that prograded into the ancient Karoo Sea. The Karoo Sea was a large inland sea located within the central part of the Gondwana supercontinent (Johnson et al, 2009).

Karoo Dolerite

The Karoo Dolerite is represented by intrusive dykes (Figure 3) and sills, within this area. It is part of the Karoo-Ferrar Large Igneous Province (LIP). This LIP comprises a succession of lavas up to 4.5 km thick. This comprises mainly basalt which was deposited about 184 Ma. This igneous deposit was extruded as a “Continental Flood Basalt” (CFB), a process that has never been witnessed by mankind. CFB eruptions take place by fissure eruption. The Karoo-Ferrar LIP triggered the break-up of the Gondwana supercontinent (Hastie et al., 2014).

5. PALAEOLOGY

Figure 4 is an extract from the SAHRIS Palaeosensitivity map. The colour coding used in the SAHRIS Palaeosensitivity Map are shown in Table 1.



Figure 4: Palaeosensitivity of the Samopfu Water Reticulation Pipeline site. Extract from SAHRIS Palaeosensitivity Map).

Table 1: Summary of SAHRIS categories

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

Aluvium

Damaged fossils could be found within the alluvium but it is very unlikely. The “Chance Find Protocol” (see section 7) will suffice in this case.

The Volksrust Formation

Evidence of trace fossil bioturbation is common within the Volksrust Formation siltstones and mudstones, however the various trace fossil (ichnofossil) types are not always identifiable. These are common and of little Palaeontological Significance.

The bivalve *Megadesmus* has once been recoded from the Volksrust Formation (Cairncross et al., 2005). This fossil is large, 9 cm dorsally and 8.4 cm laterally (Figure 5). *Megadesmus* is known from other parts of the Gondwana Supercontinent (Australia, India, Siberia, South America and Tasmania). Its presence indicates exclusively marine conditions. The implication for the northeastern Karoo Basin during the Late Permian is that a marine enclave existed in this geographic area of Gondwana and that terrestrial conditions did not yet prevail as in the southern basin region (Cairncross et al, 2005).

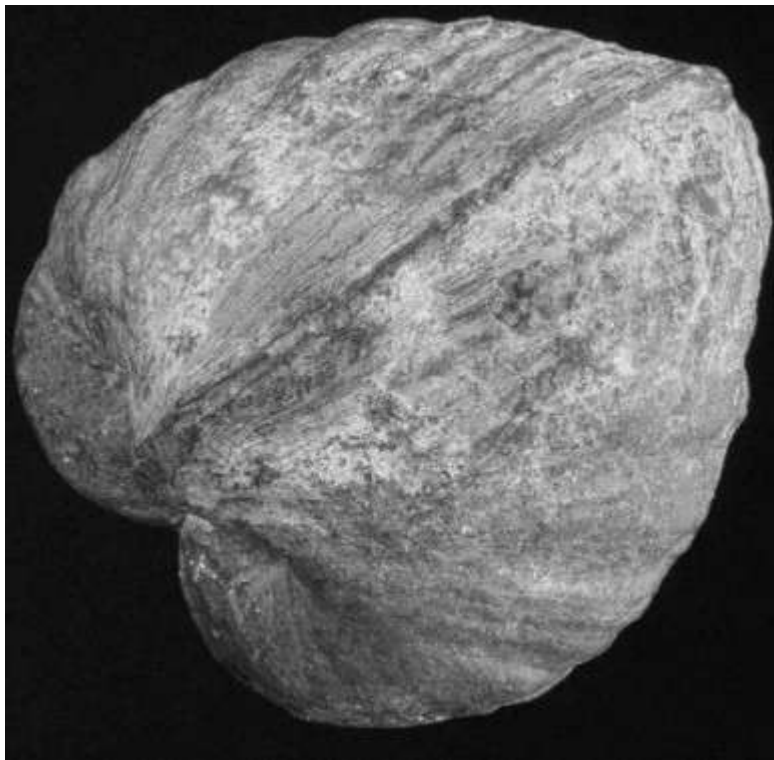


Figure 5: Megadesmus bivalve. This image was obtained from Cairncross et al. (2005).

Vryheid Formation

The SAHRIS Palaeosensitivity Map (Figure 5 – red shaded area) considers the Vryheid Fm as a **Very High Palaeosensitivity Zone**. In practise, no vertebrate fossils have been

recorded from the Vryheid Formation in this area, however invertebrate trace fossils are common (Tavener Smith, 1983; Mason and Christie, 1985; Hastie et al., 2019). Groenewald (2018) pointed out that the aquatic reptile, *Mesosaurus* (earliest known reptile from the Karoo Basin), as well as the fish, *Palaeoniscus capensis*, have been recorded in the Whitehill Formation, Eastern and Western Cape Provinces) in the southern part of the Karoo Basin (MacRae, 1999). The Whitehill Formation (500 km to the southwest), within the Main Karoo Basin, *may* be a correlative of the Vryheid Formation, however these lithological units are not physically connected. Further, recent research has shown that the lower Vryheid Formation has a southerly different source (Maurice Ewing Bank) to the rest of the Vryheid Formation in KwaZulu-Natal (Hastie et al., 2019).

Thin (uneconomic) coal seams may be present in the Vryheid Formation in this region (Tavener Smith, 1982; Hastie et al., 2019). Coal comprises compressed plant material and thus constitutes a fossil. Plants such as *glossopteris*, *gangamopteris* and *sigillaria* can be recognized, but these are common.

Karoo Dolerite

The Karoo-Ferrar LIP is an intrusive igneous rock and by definition is not fossiliferous.

6. SUMMARY

The chance of fossils being found on the Sampfu Water Reticulation Pipeline site is **Low**, but not **Zero**. A “**Chance Find Protocol**” has been included (Section 7) to cover this eventuality. No further palaeontological work is required, unless triggered by the “**Chance Find Protocol**” in which a suitably qualified palaeontologist must be consulted. The “**Chance Find Protocol**” must form part of the Environmental Management Programme (EMPr) for the site.

7. CHANCE FIND PROTOCOL

This Chance Find Protocol must be included in the site EMPr.

If any fossils are found, 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, and 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.

8. REFERENCES

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9. **DETAILS OF SPECIALIST**

Dr Alan Smith

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&

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

Role: Specialist Palaeontological Report production

Expertise of the specialist:

- PhD in Geology, University of KwaZulu-Natal. Pr. Sc. Nat., I.A.H.S.
- Msc in Stromatolites, University of KwaZulu-Natal.
- 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 + 50 journal articles with 497 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.
- Fieldwork PIA: Mpungoze water supply scheme, Empangeni. Client: Enviropro.
- Fieldwork PIA: Helpmekaar Dam. Client: Afzelia environmental consultants.
- 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.