

PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

For

**The Proposed Welgedacht
Balloon Siding near Springs,
Gauteng**

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July 2022

A Phase 1 Archaeological Impact Assessment for the Proposed Welgedacht
Balloon Siding near Springs, Gauteng

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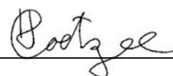
Report No: 1502211_Balloon

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I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Welgedacht Balloon Siding in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.



Date: 15 July 2022

List of Abbreviations

AIA – Archaeological Impact Assessment

CMP – Conservation Management Plan

CRM – Cultural Resource Management

EIA – Environmental Impact Assessment

ECO – Environmental Control Officer

ESA – Early Stone Age

GPS – Global Positioning System)

ha – Hectare

km – Kilometre

LSA – Later Stone Age

m – Metre

MASL – Metres Above Sea Level

MEC – Member of the Executive Council

MSA – Middle Stone Age

NHRA – National Heritage Resources Act

SAHRA – South African Heritage Resources Agency

NEMA Appendix 6

NEMA Specialist reports	
Item	Page No
1. (1) A specialist report prepared in terms of these Regulations must contain—	
(a) details of-	
(i) the specialist who prepared the report; and	Cover, 2
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Cover, Appendix B
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	2
(c) an indication of the scope of, and the purpose for which, the report was prepared;	11
(cA) an indication of the quality and age of base data used for the specialist report;	24
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	17 – 19
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	24, 30, 31
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	24
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	34 – 49
(g) an identification of any areas to be avoided, including buffers;	49 – 50
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	26
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	30, 31
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity[, including identified alternatives on the environment]or activities;	34 – 50
(k) any mitigation measures for inclusion in the EMPr;	49 – 50
(l) any conditions for inclusion in the environmental authorisation;	49 – 50
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	49 – 50
(n) a reasoned opinion—	
(i)[as to] whether the proposed activity, activities or portions thereof should be authorised	49 – 50
(iA) regarding the acceptability of the proposed activity or activities; and	49 – 50
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	49 – 50
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	29, 43

NEMA Specialist reports	
Item	Page No
(p)a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	29
(q)any other information requested by the competent authority.	Nothing received to date
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Noted

Executive Summary

The author was appointed by Elemental Sustainability (Pty) Ltd to undertake a Phase 1 Archaeological Impact Assessment for the proposed Welgedacht Balloon Siding and conveyor belt intersecting 11 farm portions (listed in **Table 1**) of the Farms Geigerle 238 IR and Palmietkuilen 241 IR near Springs in the Gauteng Province. The proposed siding is located approximately 11 km east of Springs. The aim of the study is to determine the scope of archaeological resources that could be impacted by the proposed Welgedacht Balloon Siding.

Six demolished historical sites with no surface remains, but potential subsurface material, were recorded (BA04, B05, B06, BA07, BA08, BA09), as well as one site consisting of historical building ruins (BA02), one cemetery (BA01) and a single grave (BA03).

Demolished sites BA06 and BA08 are located to the north of the proposed conveyor belt and are therefore unlikely to be impacted by the proposed development. These sites were identified when previous conveyor route options were considered. Sites BA04, BA05 and BA09 are located near the proposed infrastructure and might be associated with subsurface culturally significant material. Care should therefore be exercised during the construction phase of the project. Site BA07 is located to the west of the proposed development footprint and is unlikely to be impacted by the proposed construction of the siding.

Site BA02 consists of some of the historical Palmietkuilen Mine building remains and although the site exceeds 60 years of age, the buildings have been demolished and currently consist of building rubble. The associated ruins are therefore not considered to be significant from a heritage perspective.

The cemetery to the north of the proposed siding (BA01), as well as the grave to the north of the proposed conveyor belt (BA03) might be at risk of suffering impact should the adjacent dirt road be used as a siding access route. Should this be the case, a conservation buffer of 50 m is recommended, as well as the compilation of a Conservation Management Plan by a qualified archaeologist to ensure the safeguarding of the burial sites.

The proposed conveyor route options are almost exclusively located on cultivated land and the possibility of heritage sites being impacted is therefore significantly lower. The eastern end of the preferred conveyor belt route, however, is located at Site BA09, a site associated with demolished buildings and where subsurface cultural material might be located. Therefore, from a heritage perspective, the Alternative Conveyor Belt route is considered to be less sensitive and is therefore preferred. The additional railway line to the northwest of the project area is associated with dumping and open veldt. Due to a potential security risk, certain sections could not be inspected. Based on the visited sections and the inspection of historical aerial imagery and topographical maps, the associated area is not considered to be sensitive from a heritage perspective. However, should potential heritage sites be encountered, a qualified archaeologist must be contacted.

Subject to adherence to the recommendations and approval by SAHRA, the proposed Welgedacht Balloon Siding as per the indicated demarcations may continue. Should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage and Resources Act, 25 of 1999 section 36 (6)). Also, should culturally significant material be discovered during the course of the said development, all activities must be suspended pending further investigation by a qualified archaeologist.

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1. Project Background

1.1 Introduction

Elemental Sustainability (Pty) Ltd appointed the author to undertake a Phase 1 Archaeological Impact Assessment for the proposed Welgedacht Balloon Siding intersecting 11 farm portions (**Table 1**) of the Farms Geigerle 238 IR and Palmietkuilen 241 IR near Springs in the Gauteng Province (**Figures 1 – 3**). The proposed siding is located approximately 11 km east of Springs, 17 km northeast of Dunnottar and 18 km southwest of Delmas. The purpose of this study is to examine the demarcated study area in order to determine if any archaeological resources of heritage value will be impacted by the proposed siding, as well as to archaeologically contextualise the general study area. The aim of this report is to provide the developer with information regarding the location of heritage resources on the demarcated study area.

In the following report, the implication for the construction of the Welgedacht Balloon Siding on the demarcated portions with regard to heritage resources is discussed: Portions 10, 30, 32, 45, 51, 55 and 57 of the Farm Geigerle 238 IR, and Portions 2, 9, 19 and 20 of the Farm Palmietkuilen 241 IR. The development will primarily consist of a railway siding, a stockpile area, a PCD dam and a conveyor belt of between 4.1 and 2.7 km. The legislation section included serves as a guide towards the effective identification and protection of heritage resources and will apply to any such material unearthed during development and construction phases within the demarcated study area.

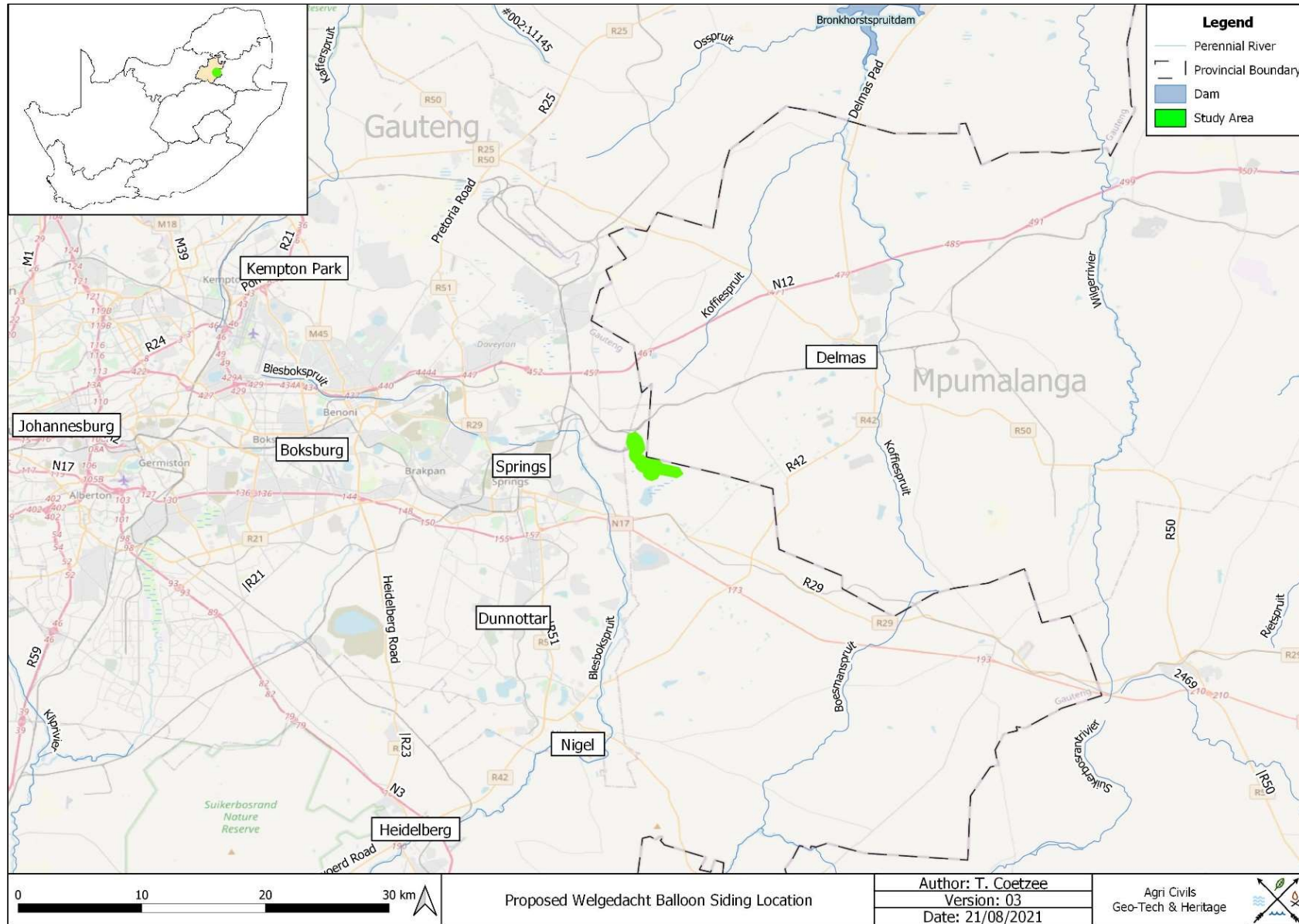


Figure 1: Regional and Provincial location of the study area.

1.2 Legislation

The South African Heritage Resources Agency (SAHRA) aims to conserve and control the management, research, alteration and destruction of cultural resources of South Africa and to prosecute if necessary. It is therefore crucially important to adhere to heritage resource legislation contained in the Government Gazette of the Republic of South Africa (Act No.25 of 1999), as many heritage sites are threatened daily by development. Conservation legislation requires an impact assessment report to be submitted for development authorisation that must include an AIA (Archaeological Impact Assessment) if triggered.

AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources that might occur in areas of development and (b) make recommendations for protection or mitigation of the impact of the sites.

1.2.1 The EIA (Environmental Impact Assessment) and AIA processes

Phase 1 Archaeological Impact Assessments generally involve the identification of sites during a field survey with assessment of their significance, the possible impact that the development might have, and relevant recommendations.

All Archaeological Impact Assessment reports should include:

- a. Location of the sites that are found;
- b. Short descriptions of the characteristics of each site;
- c. Short assessments of how important each site is, indicating which should be conserved and which mitigated;
- d. Assessments of the potential impact of the development on the site(s);
- e. In some cases a shovel test, to establish the extent of a site, or collection of material, to identify the associations of the site, may be necessary (a pre-arranged SAHRA permit is required); and
- f. Recommendations for conservation or mitigation.

This AIA report is intended to inform the client about the legislative protection of heritage resources and their significance and make appropriate recommendations. It is essential to also provide the heritage authority with sufficient information about the sites to enable the authority to assess with confidence:

- a. Whether or not it has objections to a development;
- b. What the conditions are upon which such development might proceed;

- c. Which sites require permits for mitigation or destruction;
- d. Which sites require mitigation and what this should comprise;
- e. Whether sites must be conserved and what alternatives can be proposed to relocate the development in such a way as to conserve other sites; and
- f. What measures should or could be put in place to protect the sites which should be conserved.

When a Phase 1 AIA is part of an EIA, wider issues such as public consultation and assessment of the spatial and visual impacts of the development may be undertaken as part of the general study and may not be required from the archaeologist. If, however, the Phase 1 project forms a major component of an AIA it will be necessary to ensure that the study addresses such issues and complies with Section 38 of the National Heritage Resources Act.

1.2.2 Legislation regarding archaeology and heritage sites

National Heritage Resource Act No.25 of April 1999

Buildings are among the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Farming Community settlements. The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives;
- any other prescribed category.

With regards to activities and work on archaeological and heritage sites this Act states that:

“No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.” (34. [1] 1999:58)

and

“No person may, without a permit issued by the responsible heritage resources authority:

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;*
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;*
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or*
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.”(35. [4] 1999:58)*

and

“No person may, without a permit issued by SAHRA or a provincial heritage resources authority:

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;*
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals.” (36. [3] 1999:60)*

On the development of any area the gazette states that:

“...any person who intends to undertake a development categorised as:

- (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) the construction of a bridge or similar structure exceeding 50m in length;*

- (c) *any development or other activity which will change the character of a site-*

 - i. *exceeding 5000m² in extent; or*
 - ii. *involving three or more existing erven or subdivisions thereof; or*
 - iii. *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - iv. *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

- (d) *the re-zoning of a site exceeding 10000m² in extent; or*
- (e) *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.” (38. [1] 1999:62-64)*

and

“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.”*
(38. [3] 1999:64)

The Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities. Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act as well as the Human Tissues Act, 1983.

2. Study Area and Project Description

2.1 Location & Physical Environment

The proposed Welgedacht Balloon Siding study area is situated to the east of Springs. The 11 identified farm portions are listed below:

Table 1: Property name & coordinates

Property	Portion	Map Reference (1:50 000)	Lat	Lon	Intersecting Parcel Size (ha)
Geigerle 238 IR	10/238	2628 BA	-26.22196810	28.52663544	52.5
Geigerle 238 IR	30/238	2628 BA	-26.2219907	28.5118715	109
Geigerle 238 IR	32/238	2628 BA	-26.21140238	28.51971874	4.2
Geigerle 238 IR	45/238	2628 BA	-26.222242	28.515233	3.5
Geigerle 238 IR	51/238	2628 BA	-26.21173309	28.52348390	10.3
Geigerle 238 IR	55/238	2628 BA	-26.21614525	28.52216325	25.2
Geigerle 238 IR	57/238	2628 BA	-26.22028728	28.51931186	21.5
Palmietkuilen 241 IR	2/241	2628 BA	-26.24564975	28.56578667	1489
Palmietkuilen 241 IR	9/241	2628 BA	-26.22471444	28.52226830	310.6
Palmietkuilen 241 IR	19/241	2628 BA	-26.23275838	28.53310361	1908.4
Palmietkuilen 241 IR	20/241	2628 BA	-26.2225411	28.5172122	0.7

The closest town to the study area is Springs, located 11 km to the west. Dunnottar is located roughly 17 km to the southwest and Delmas 18 km to the northeast of the proposed Welgedacht Balloon Siding (**Figures 1 – 3**). The study area falls within the Sedibeng District Municipality and in the north-western corner of the Lesedi Local Municipality in the Gauteng Province. In terms of vegetation, the majority of the study area falls within the Grassland Biome, while a small section towards the east falls within the Savanna Biome. According to the vegetation classification by Mucina & Rutherford (2006) the western section of the study area falls within the Soweto Highveld Grassland vegetation unit, while a small portion of the south-eastern section falls within Andesite Mountain Bushveld and Eastern Highveld Grassland.

Soweto Highveld Grassland is found in the Mpumalanga and Gauteng Provinces between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River in the south. The western parts extend along the southern edge of the Johannesburg Dome as far as Randfontein and include Vanderbijlpark and Vereeniging in southern Gauteng, as well as Sasolburg in the northern Free State. This type of vegetation is considered to be endangered and has a conservation target of 24%. Only small patches are conserved and cultivation, urban sprawl, mining, dams and road infrastructure have transformed about half of the area. Erosion is generally very low (Mucina & Rutherford 2006).

Andesite Mountain Bushveld is found in the Gauteng, North West, Mpumalanga and Free State Provinces. Separate areas associated with Andesite Mountain Bushveld include the Bronberg Ridge in eastern Pretoria extending to Welbekend; from Hartebeeshoek in the west along the valley to the hills at Atteridgeville; the hills around southern Johannesburg; the hills at Nigel, Willemsdal, Coalbrook, and Suikerbosrand; the outer ring of the Vredefort Dome and some hills to the northwest of Potchefstroom. This vegetation unit is considered least threatened and has a conservation target of 24%. About 7% is statutorily conserved in the Suikerbosrand Nature Reserve and Magaliesberg Nature Area, and 1-2% in other reserves. About 15% has been transformed by cultivation and urban built-up areas. Erosion is considered very low (Mucina & Rutherford 2006).

Eastern Highveld Grassland's conservation status is considered to be endangered with a conservation target of 24%. Only a small portion is conserved in statutory and private reserves. Eastern Highveld Grassland consists of the plains between Belfast in the east and the eastern side of Johannesburg in the west and also extends towards Bethal, Ermelo and to the west of Piet Retief. This vegetation type is associated with slightly to moderately undulating planes and includes low hills and pan depressions. The general vegetation is short dense grassland with small, scattered rocky outcrops and some woody species. About 44% of this vegetation unit has been transformed by cultivation, plantations, mines, urbanisation and the building of dams. Although no serious alien invasions are reported, *Acacia mearnsii* may become dominant in disturbed areas. Erosion associated with this vegetation unit is low (Mucina & Rutherford 2006).

The average elevation for Soweto Highveld Grassland ranges from 1420 to 1760 MASL (metres above sea level), while Andesite Mountain Bushveld is found between 1350 and 1800 MASL and Eastern Highveld Grassland between 1520 and 1780 MASL (Mucina & Rutherford 2006). The average elevation of the project area is 1613 MASL and slopes slightly from the lower north-western and south-eastern sections to the higher mid-section.

The study area falls within the summer rainfall region and the average annual rainfall is roughly 699 mm per year. The average annual temperature is 15.5 °C. The average summer temperature is 20 °C, while the winter temperature averages 8.9 °C (Climate-data.org accessed 23/12/2020).

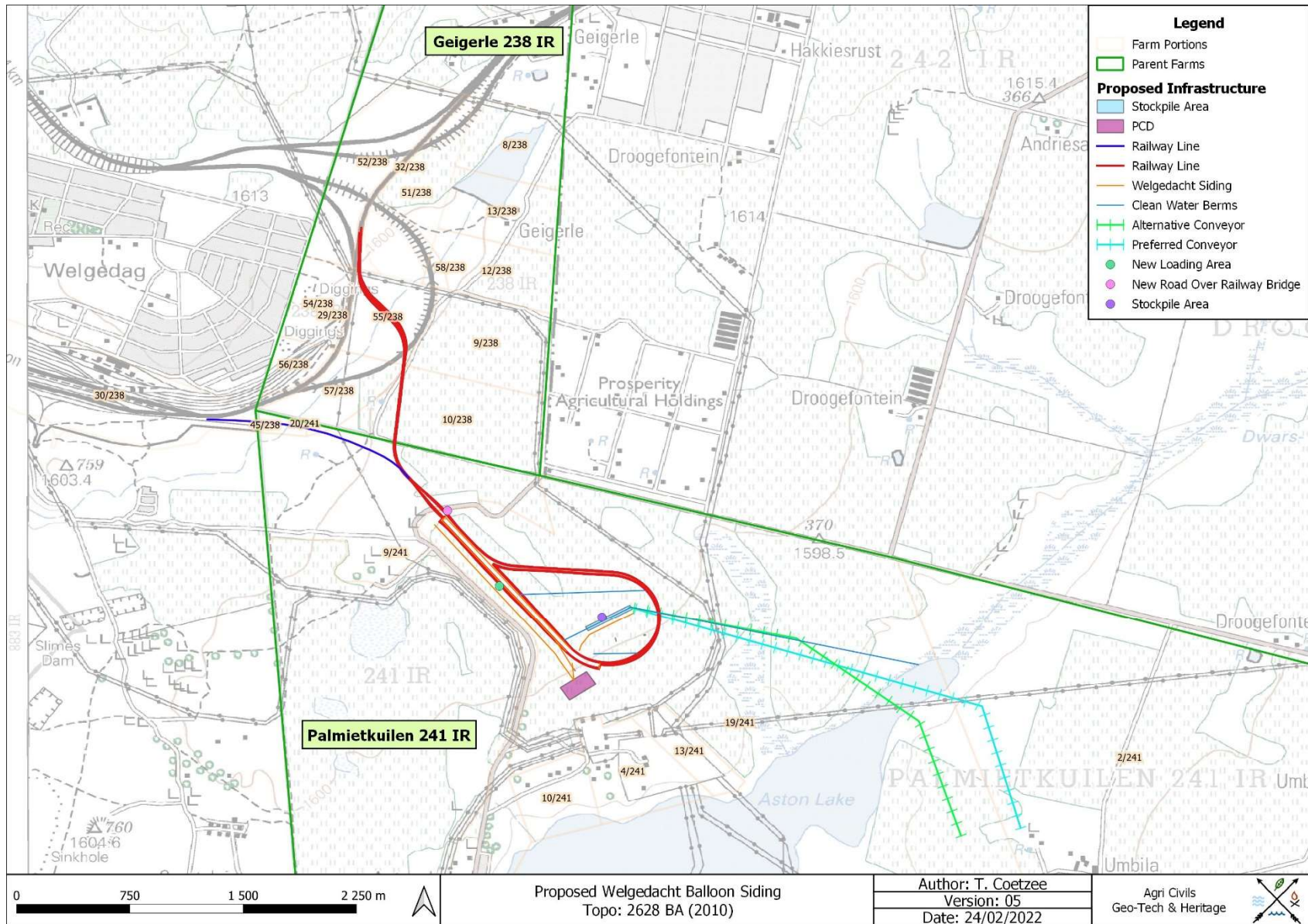
The study area falls within the C21D and C21E Quaternary Catchments that form part of the Upper Vaal Water Management Area. The closest perennial river to the study area is Blesbokspruit that flows 3.6 km to the southwest. Another perennial river, Koffiespruit, flows approximately 4 km to the northeast.

When the surrounding environment is considered, the general study area is associated with crop cultivation and historical mining activity. Access to the study area is via tertiary and jeep track farm roads turning from secondary dirt roads (**Figures 2 & 3**).

Historical aerial images and topographical maps (**Appendix A**) show that the majority of the study area has been cultivated since at least 1944, while buildings are visible near the centre of the study area. By 1953 buildings are visible near the northern boundary of the study area but appear to have been demolished by 1961.

2.2 Project description

Canyon Resources (Pty) Ltd plans the construction of the Welgedacht Balloon Siding intersecting several farm portions of the Farms Geigerle 238 IR and Palmietkuilen 241 IR near Springs in the Gauteng Province (**Figure 3**). The total proposed construction area is approximately 56 ha and will consist of railway infrastructure, weigh bridges, access roads, haul roads, a product stockpile area, a pollution control dam, stormwater trenches, security offices and fuel storage, as well as a conveyor belt. Two options were provided for the proposed conveyor belt. Both the preferred and alternative options run directly from the proposed siding in an eastern direction. The preferred option, however, continues further to the east before turning into a southern direction. The preferred option measures 3 km and the alternative option 2.72 km. Only one option for the proposed conveyor belt will be selected. The aim of the siding is to transport coal from the proposed Palmietkuilen Mining Project.



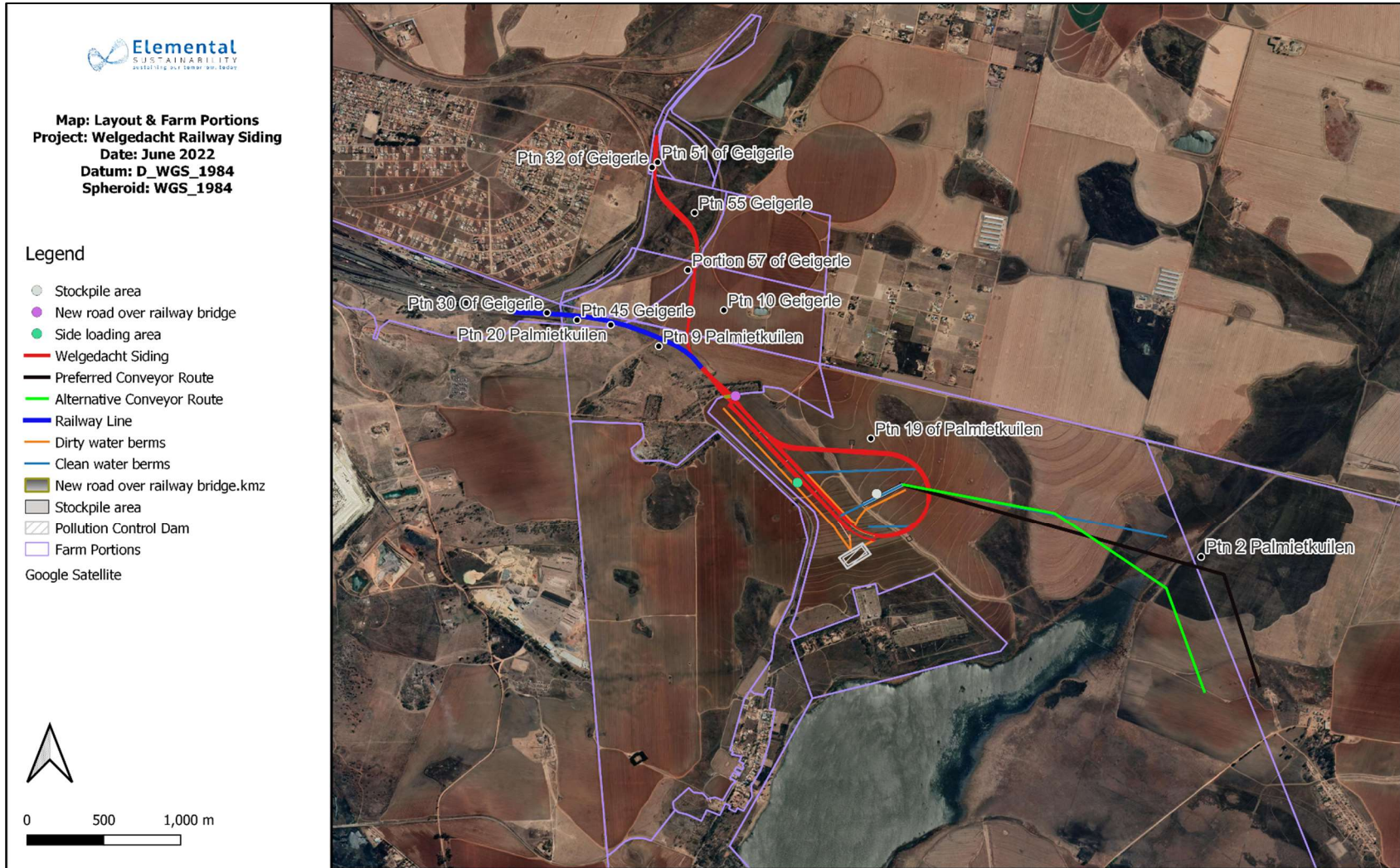


Figure 3: Proposed layout of the Welgedacht Balloon Siding (supplied by Elemental Sustainability 2022).

3. Archaeological Background

Southern African archaeology is broadly divided into the Early, Middle and Later Stone Ages; Early, Middle and Later Iron Ages; and Historical or Colonial Periods. This section of the report provides a general background to archaeology in South Africa and focuses on more site-specific elements where relevant.

3.1 The Stone Ages

The earliest stone tool industry, the Oldowan, was developed by early human ancestors which were the earliest members of the genus *Homo*, such as *Homo habilis*, around 2.6 million years ago. It comprises tools such as cobble cores and pebble choppers (Toth & Schick 2007). Archaeologists suggest these stone tools are the earliest direct evidence for culture in southern Africa (Clarke & Kuman 2000). The advent of culture indicates the advent of more cognitively modern hominins (Mitchell 2002: 56, 57)

The Acheulean industry completely replaced the Oldowan industry. The Acheulian industry was first developed by *Homo ergaster* between 1.8 to 1.65 million years ago and lasted until around 300 000 years ago. Archaeological evidence from this period is also found at Swartkrans, Kromdraai and Sterkfontein. The most typical tools of the ESA (Early Stone Age) are handaxes, cleavers, choppers and spheroids. Although hominins seemingly used handaxes often, scholars disagree about their use. There are no indications of hafting, and some artefacts are far too large for it. Hominins likely used choppers and scrapers for skinning and butchering scavenged animals and often obtained sharp ended sticks for digging up edible roots. Presumably, early humans used wooden spears as early as 5 million years ago to hunt small animals.

Middle Stone Age (MSA) artefacts started appearing about 250 000 years ago and replaced the larger Early Stone Age bifaces, handaxes and cleavers with smaller flake industries consisting of scrapers, points and blades. These artefacts roughly fall in the 40-100 mm size range and were, in some cases, attached to handles, indicating a significant technical advance. The first *Homo sapiens* species also emerged during this period. Associated sites are Klasies River Mouth, Blombos Cave and Border Cave (Deacon & Deacon 1999).

Although the transition from the Middle Stone Age to the Later Stone Age (LSA) did not occur simultaneously across the whole of southern Africa, the Later Stone Age ranges from about 20 000 to 2000 years ago. Stone tools from this period are generally smaller, but were used to do the same job as those from previous periods; only in a different, more efficient way. The Later Stone Age is associated with: rock art, smaller stone tools (microliths), bows and arrows, bored stones, grooved stones, polished bone tools, earthenware pottery and beads. Examples of Later Stone Age sites are Nelson Bay Cave, Rose Cottage Cave and Boomplaas Cave (Deacon & Deacon 1999).

3.2 The Iron Age & Later History

The Early Iron Age marks the movement of farming communities into South Africa in the first millennium AD, or around 2500 years ago (Mitchell 2002:259, 260). These groups were agro-pastoralist communities that settled in the vicinity of water in order to provide subsistence for their cattle and crops. Archaeological evidence from Early Iron Age sites is mostly artefacts in the form of ceramic assemblages. The origins and archaeological identities of this period are largely based upon ceramic typologies. Some scholars classify Early Iron Age ceramic traditions into different “streams” or “trends” in pot types and decoration, which emerged over time in southern Africa. These “streams” are identified as the Kwale Branch (east), the Nkope Branch (central) and the Kalundu Branch (west). Early Iron Age ceramics typically display features such as large and prominent inverted rims, large neck areas and fine elaborate decorations. This period continued until the end of the first millennium AD (Mitchell 2002; Huffman 2007). Some well-known Early Iron Age sites include the Lydenburg Heads in Mpumalanga, Happy Rest in the Limpopo Province and Mzonjani in Kwa-Zulu Natal.

The Middle Iron Age roughly stretches from AD 900 to 1300 and marks the origins of the Zimbabwe culture. During this period cattle herding appeared to play an increasingly important role in society. However, it was proved that cattle remained an important source of wealth throughout the Iron Age. An important shift in the Iron Age of southern Africa took place in the Shashe-Limpopo basin during this period, namely the development of class distinction and sacred leadership. The Zimbabwe culture can be divided into three periods based on certain capitals. Mapungubwe, the first period, dates from AD 1220 to 1300, Great Zimbabwe from AD 1300 to 1450, and Khami from AD 1450 to 1820 (Huffman 2007: 361, 362).

The Late Iron Age roughly dates from AD 1300 to 1840. It is generally accepted that Great Zimbabwe replaced Mapungubwe. Some characteristics include a greater focus on economic growth and the increased importance of trade. Specialisation in terms of natural resources also started to play a role, as can be seen from the distribution of iron slag which tend to occur only in certain localities compared to a wide distribution during earlier times. It was also during the Late Iron Age that different areas of South Africa were populated, such as the interior of KwaZulu Natal, the Free State, the Gauteng Highveld and the Transkei. Another characteristic is the increased use of stone as building material. Some artefacts associated with this period are knife-blades, hoes, adzes, awls, other metal objects as well as bone tools and grinding stones.

The Historical period mainly deals with Europe’s discovery, settlement and impact on southern Africa. Some topics covered by the Historical period include Dutch settlement in the Western Cape, early mission stations, Voortrekker routes and the Anglo Boer War. This time period also saw the compilation of early maps by missionaries, explorers, military personnel, etc.

3.2.3 Springs general history

The Springs area increased in importance when coal was discovered in the vicinity in 1888, which led to the building of the first railway in the Transvaal. The railway, known as the 'Rand Tram' was built in 1890 with the purpose of carrying coal from the East Rand coal mines to Johannesburg. Springs, named after the high number of fountains on the farm of the same name, was established during November 1904 in response to the six collieries established in the area. The town's first inhabitants were predominantly Welshmen working in the coal mines, but also formed the Springs Male Voice Choir. Coal mining eventually declined in the area, but was replaced by gold and industry (Bulpin 1986: 607).

4. Methodology

Archaeological reconnaissance of the study area was conducted during November 2020, January 2021 and July 2022 through a combination of unsystematic vehicular and pedestrian surveys of the proposed surface infrastructure areas (**Figure 4**). At the time of the initial survey, the proposed conveyor belt locations were not available and were therefore inspected at a later stage. The proposed routes of both conveyor belts were later again altered and an additional railway line was proposed. These areas were assessed during July 2022. General site conditions were recorded via photographic record (**Figures 5 – 9**). Also, the project area was inspected beforehand on Google Earth, historical aerial imagery and topographical maps in order to identify potential heritage remains (**Appendix A**). Nine sites (**Table 2**) were identified during the study through a combination of inspecting historical topographical maps, aerial images, through personal communication with land owners, as well as through personal observation during the survey. Six of the sites identified on historical maps and aerial imagery have been demolished. It should be noted that the prefix '2629' is not used when referring to the site names due to the length of the name, but are recorded as such in **Tables 2 & 6**. The historical topographical datasets dating to 1965 and 1977, as well as the historical aerial photographs dating to 1944, 1953, 1958, 1961, 1969, 1976, 1985 and 1991 proved useful in terms of providing an indication of the location and age of some of the structures and features associated with the study area. The total area inspected was roughly 56 ha.

The reconnaissance of the area under investigation served a twofold purpose:

- To obtain an indication of heritage material found in the general area as well as to identify or locate archaeological sites on the areas demarcated for development. This was done in order to establish a heritage context and to supplement background information that would benefit developers through identifying areas that are sensitive from a heritage perspective.

- All archaeological and historical events have spatial definitions in addition to their cultural and chronological context. Where applicable, spatial recording of these definitions were done by means of a handheld GPS (Global Positioning System) during the site visit, as well as by plotting the boundaries from aerial imagery and topographical maps.

Table 2: Site coordinates & description.

Abbreviated name	Site / Survey Point Name	Longitude	Latitude	Description	Current Status	Identification Source
BA01	2628BA-01	28.525554	-26.214341	Cemetery	In-tact	Field
BA02	2628BA-02	28.524466	-26.227059	Building ruins	Ruins	Aerial (1944)
BA03	2628BA-03	28.548107	-26.229526	Grave	In-tact	Field
BA04	2628BA-04	28.522154	-26.223871	Building	Demolished	Aerial (1961)
BA05	2628BA-05	28.522527	-26.218126	Building	Demolished	Aerial (1953)
BA06	2628BA-06	28.551121	-26.230983	Building	Demolished	Aerial (1944)
BA07	2628BA-07	28.520738	-26.221363	Building	Demolished	Aerial (1944)
BA08	2628BA-08	28.555246	-26.231974	Building	Demolished	Aerial (1953)
BA09	2628BA-09	28.559237	-26.246305	Building	Demolished	Aerial (1953)

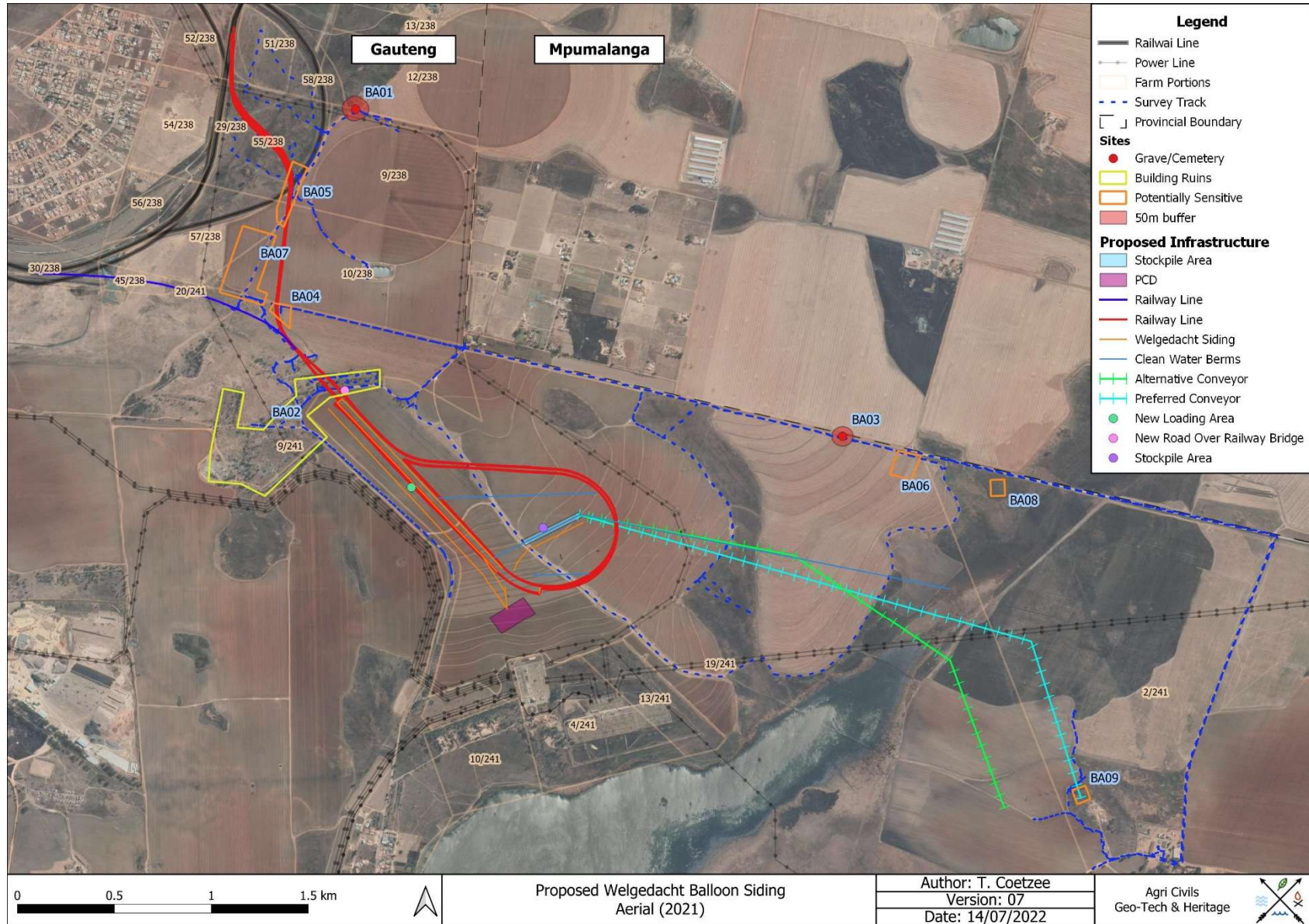


Figure 4: Study area with recorded sites portrayed on a 2021 aerial image.



Figure 5: Northern extent of the study area between the existing railways.



Figure 6: Cultivated section.



Figure 7: Open veldt to the south of the proposed conveyor belt route options.



Figure 8: Area between the eastern ends of the two conveyor belt route options.



Figure 9: Open veldt to the north of the proposed conveyor belt route options.

4.1 Sources of information

At all times during the survey, standard archaeological procedures for the observation of heritage resources were followed. As most archaeological material occur in single or multiple stratified layers beneath the soil surface, special attention was paid to disturbances; both man-made such as roads and clearings, and those made by natural agents such as burrowing animals and erosion. Locations associated with archaeological material remains were recorded by means of a Garmin Oregon 750 GPS. These sites, as well as general site conditions, were photographed with a Sony Cyber-shot camera.

A literature study, which incorporated previous work done in the region, was conducted in order to place the study area into context from a heritage perspective.

Personal communication with Mr. Andries Visser, the farm manager on Portion 19 of the Farm Palmietkuilen 241 IR, proved useful in locating graves and historical infrastructure (Andries Visser, pers. Comm. 2021).

4.1.1 Previous Heritage Studies

Proposed Welgedacht Coal Prospecting Right and Environmental Authorisation Application

A Heritage Desktop Report was compiled by Van Der Walt (2019) for the Proposed Welgedacht Coal Prospecting Right and Environmental Authorisation Application on Portions 5, 19, 20, 21, 22, 27, 33, 42, 43, 64, 65, 66, 67 and 76 of the Farm Holfontein 71 IR and Portions 26 and 32 of the Farm Welgedacht 74 IR. The majority of the study area is located between four and 12 km northeast of the proposed Welgedacht Balloon Siding. The study

noted that very few heritage sites occur in the vicinity of the study area, but that it might be attributed to a lack of research in the area. Accordingly, archaeological or historical sites that might be encountered in the area include LSA material, cemeteries and homesteads/structures

Erwat Sewer Outfall Route

A Heritage Impact Assessment was conducted for the construction of the Erwat Sewer outfall route and two sewer sites on the Klipfontein 70 IR, Welgedacht 74 IR, Modderfontein 76 IR and Geduld 123 IR Farms within the Ekurhuleni Metropolitan Municipality. The site is located between 11 and 19 km northwest of the proposed Welgedacht Balloon Siding. Van Schalkwyk (1997) surveyed the area and identified two cemeteries, one located on the farm Klipfontein and the other just west of the old Modderfontein slimes dam. The latter dates to the turn of the century and contains about 1000 graves belonging to Chinese mine labourers. Several structures relating to mining and farming activities, as well as several houses possibly dating to the 1930s, were observed.

Gold One International Holfontein Project

Pelser (2015) conducted a Baseline Study Phase 1 HIA for the Gold One International Holfontein Project near the old Holfontein Shaft and existing Modder East operations. Although background research indicated the presence of cultural heritage sites in the larger area, the study did not identify any heritage material of significance within the development footprint. General sites observed include old mining infrastructure, residences and cemeteries. The study area is located between three and 11 km south-southeast of the proposed Welgedacht Balloon Siding.

Palmietkuilen Mine

A Heritage Impact Assessment was conducted for the proposed Palmietkuilen Mine by Digby Wells (Du Piesanie 2016). The Palmietkuilen Mine study area is located in the general vicinity of the proposed Welgedacht Balloon Siding. The study located 158 heritage resources in the general area of which seven occurred within the site-specific study area. The identified sites range from the Late Farming Community to the historical period. The site-specific sites, however, include historical built environment and burial grounds and graves only. It should be noted that some of the sections overlap with the proposed Welgedacht Balloon Siding study area, but the exact areas visited could not be determined from the report. It should also be noted that the study focussed mainly on the demarcated infrastructure area and the possibility therefore exists that smaller sites located further away and closer to the proposed Welgedacht Balloon Siding were not recorded.

4.2 Limitations

During the initial survey (November 2020), the majority of the study area was characterised by a combination of burnt grassland, recently cultivated maize fields, demolished buildings and dumping areas. Visibility at this time was generally considered to be good (**Figures 10 & 11**). The areas characterised by dumping limited access to a certain extent due to a potentially unsafe situation (**Figure 12**). These areas, however, were mostly encountered to the west of the proposed siding at the location of a historical mine.

The surveying of the initially proposed conveyor belts that took place during January 2021 saw a generally densely vegetated environment as a result of heavy rainfall (**Figures 13 & 14**). Wet conditions also hampered access to the eastern-most section of the study area. Personal communication with the farm manager, however, confirmed the absence of structures and buildings on the concerned section and aided in locating burial sites. The location of the proposed conveyor belt routes, however, were subsequently changed and an additional railway line to the northwest of the study area (marked in blue) was added. These areas were inspected during July 2022. The entire proposed conveyor belt routes could not be surveyed due to wet conditions. However, the proposed conveyor belt routes are largely located on cultivated land that is not considered to be as sensitive from a heritage perspective (**Figure 15**). It should be noted that the eastern end of the preferred conveyor belt route is located in the vicinity of demolished buildings. This area was accessed and inspected. The new railway line that is proposed to the northwest of the study area falls on open veldt (**Figure 16**). Sections of the new railway line are associated with dumping and some areas could not be assessed due to a potentially unsafe situation (**Figure 17**). Historical aerial imagery and topographical maps, however, indicate the absence of buildings and structures in the direct vicinity of the proposed railway line.



Figure 10: Good visibility in areas associated with short grass cover and cultivated fields.



Figure 11: Fairly good visibility associated with cultivated fields and its surroundings.



Figure 12: Dumping to the west of the proposed siding.



Figure 13: Dense vegetation towards to southeast (Jan 2021).



Figure 14: Wet conditions during January 2021.



Figure 15: Cultivated sections associated with the proposed conveyor belt routes (July 2022).



Figure 16: Open veldt associated with the proposed railway line to the northwest (July 2022).



Figure 17: Dumping associated with a section of the proposed railway line to the northwest (July 2022).

5. Archaeological and Historical Remains

5.1 Stone Age Remains

No Stone Age archaeological remains were located within the demarcated study area.

Although no Stone Age archaeological remains were located, such artefacts may occur in the area. These artefacts are often associated with rocky outcrops or water sources. **Figures 18 – 20** below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

Archaeological studies conducted in the surrounding areas also did not locate material pertaining to the Stone Age, but the study by Van der Walt (2019) noted that LSA material might be present in the general area.

According to Bergh (1999: 5), no major Stone Age archaeological sites are located in the direct vicinity of Springs

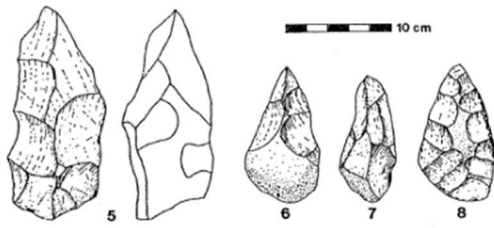


Figure 18: ESA artefacts from Sterkfontein (Volman 1984).

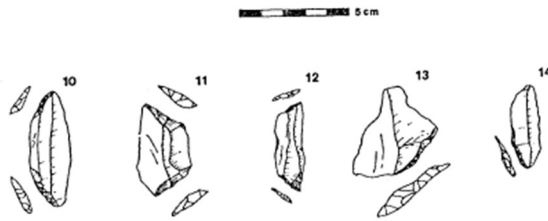


Figure 19: MSA artefacts from Howiesons Poort (Volman 1984).



Figure 20: LSA scrapers (Klein 1984).

5.2 Iron Age Farmer Remains

No Iron Age Farmer remains were located within the demarcated study area.

The heritage study conducted by Du Piesanie (2016) recorded heritage sites in the general area that belong to Late Farming Communities.

5.3 Historical

Seven Historical sites were identified on historical aerial images and topographical maps, six of which have completely been demolished and are not associated with surface material (**Table 3**). The only site associated with surface remains consists of several demolished buildings.

Sites BA02, BA06 and BA07 were identified on the aerial image dating to 1944 (**Appendix A: Figure 37**). Site BA02 consists of the building and infrastructure remains of the historical Palmietkuilen Mine. The section of the site where the railway siding is proposed is characterised by the remains of 11 residential houses. A tar road is found on the northern, eastern and southern sides of the residences and the entire complex of surrounded by a

line of trees. Each erf measures approximately 1000m². It should be noted that the general mining area was not surveyed due to it falling outside of the proposed siding impact area, as well as the area appearing unsafe. The residential remains intersecting the proposed railway siding is in a severely dilapidated state as the buildings have completely been demolished. Remains include building rubble consisting of bricks and cement, foundations and the bordering tar road (**Figures 21 – 24**). These buildings appear to be intact on the 1969 aerial image (**Appendix A: Figure 41**), but based on topographical maps, have been demolished between 1977 and 1995 (**Appendix A: Figures 46 & 47**). Also worthy to note is the fact that the trees associated with the residences are barely visible on the 1944 aerial image, but are clearly visible by 1953 (**Appendix A: Figure 38**). Research has shown that the Palmietkuil Mine remained in operation between 1910 and 1953. East Rand Mining Estates, however, sold the Grootvlei and Palmietkuil coal deposits to the Old Largo Company in 1919. According to a map depicting the Largo Colliery Workings of 1936, the residences associated with Site BA02 were the married quarters for the mine's employees. The structures are therefore at least 86 years old.

Sites BA06 and BA07, identified as buildings on the aerial image dating to 1944, are at least 78 years old (**Appendix A: Figure 37**). Site BA06 appears to have been a relatively small building to the north of the proposed conveyor belt on Portion 19/241. The building remains are visible until 1976 (**Appendix A: Figure 42**), whereafter it was demolished to make room for the expansion of the bordering cultivated field (**Figure 25**). The topographical map of 1977 (**Appendix A: Figure 46**), however, is the only topographical map to indicate the building. Site BA07 on Portions 10/238, 57/238 and 9/241 remained visible to a certain extent on the 1991 aerial image (**Appendix A: Figure 44**), but was subsequently completely demolished and replaced by cultivated fields (**Figure 26**). According to the topographical maps, Site BA07 was demolished between 1965 and 1977 (**Appendix A: Figures 45 & 46**).

Sites BA05, B08 and BA09 first appear on the 1953 aerial image and are therefore at least 69 years old (**Appendix A: Figure 38**). Site BA05 was associated with several buildings on portions 9/238, 10/238, 55/238 and 57/238 until 1958 (**Appendix A: Figure 39**), but appear to have been demolished by 1961 (**Appendix A: Figure 40**), most likely due to expanding crop cultivation. Between 1976 (**Appendix A: Figure 42**) and 1985 (**Appendix A: Figure 43**) a railway line was constructed that intersected the site and further disturbed the archaeological context (**Figure 27**).

Site BA08 is located to the north of the proposed conveyor belt on Portion 2/241. The site is visible on the 1953 and 1958 aerial images as what appears to be a small building (**Appendix A: Figure 38 & 39**). No structure or building, however, is visible on aerial imagery thereafter. According to the 1965 topographical map (**Appendix A: Figure 45**), a hut was present at this location, but was demolished by 1977 (**Appendix A: Figure 46**). At present, Site BA08 is associated with open veldt (**Figure 28**).

Site BA09 is located at the eastern end of the proposed Preferred Conveyor belt on Portion 2/241. Buildings are visible on the 1953, 1958, 1961 and 1969 aerial images (**Appendix A: Figures 38, 39, 40, 41**), as well as on the 1965 and 1977 topographical maps (**Appendix A: Figures 45 & 46**). No buildings, however, are indicated on the 1995 topographical map (**Appendix A: Figure 47**), while one building and a ruin are shown on the 2010 topographical map (**Appendix A: Figure 48**). According to the 1965 topographical map, the buildings were used as a piggery (**Appendix A: Figure 45**). Currently Site B09 is not associated with buildings/structures (**Figure 29**), but traces of demolished structures are visible on contemporary satellite imagery (**Figure 4**). It should be noted that buildings potentially belonging to the piggery are located further to the southeast of the end of the proposed Preferred Conveyor belt, but fall outside of the development footprint and are therefore not at risk of being impacted by the proposed project.

The structure or building associated with Site BA04 on Portion 9/241 was first detected on the 1961 aerial image (**Appendix A: Figure 40**) and appears to have been further developed by 1969 (**Appendix A: Figure 41**). The initial structure, therefore, is at least 61 years old. By 1976 (**Appendix A: Figure 42**), however, the building is no longer visible and by 1991 (**Appendix A: Figure 44**) part of the site was replaced by cultivated crops. At present, the eastern section of the site still consists of crop cultivation, while the western section is characterised by open veldt. No surface remains were observed at the site (**Figure 30**).

Table 3: Historical sites.

Name	Type	Source	Year	Status	Age	Estimated extent (ha)	Parcel
BA02	Building Ruins	Field	Unknown	Ruins	Historical	24	9/241; 19/241
BA04	Building	Aerial	1958-1961	Demolished	Historical	0.8	9/241
BA05	Building	Aerial	1953	Demolished	Historical	2.5	10/238; 55/238; 57/238
BA06	Building	Aerial	1944	Demolished	Historical	1.5	19/241
BA07	Building	Aerial	1944	Demolished	Historical	6.9	10/238; 57/238; 9/241
BA08	Building	Aerial	1953	Demolished	Historical	0.6	2/241
BA09	Building	Aerial	1953	Demolished	Historical	0.5	2/241



Figure 21: Building rubble at Site BA02.



Figure 22: General condition of structures associated with Site BA02.



Figure 23: Foundation remains at Site BA02.



Figure 24: Road at Site BA02.



Figure 25: Environment associated with Site BA06.



Figure 26: Environment associated with Site BA07.



Figure 27: Potentially sensitive area at Site BA05.



Figure 28: Environment at Site BA08.



Figure 29: Environment associated with Site BA09.



Figure 30: Potentially sensitive area at Site BA04.

Heritage studies conducted in the surrounding areas recorded similar historical mining infrastructure and homesteads observed in this study. See Van Schalkwyk (1997), Pelsner (2015) and Du Piesanie (2016).

5.4 Contemporary Remains

Contemporary building rubble was observed between the two existing railway lines towards the northern edge of the study area (**Figure 31**). No structures or buildings are visible at this locality on historical aerial imagery and topographical maps (**Appendix A**), which suggests that the rubble was either moved to the area from somewhere else, or resulted from the building of the railway.



Figure 31: Contemporary building rubble to the north of the proposed siding.

Heritage studies conducted in the surrounding areas did not mention significant contemporary remains. See Van Schalkwyk (1997), Pelsler (2015), Van Der Walt (2019) and Du Piesanie (2016).

5.5 Graves

One grave and one cemetery were observed during the pedestrian survey and are listed in **Table 4**.

Cemetery BA01 is located on Portions 12/238 and 9/238 and approximately 400 m northeast of the proposed railway siding (**Figures 32 – 35**). The cemetery borders a local dirt road to the east and a dam/quarry to the north. The cemetery consists of approximately 26 unfenced graves and it is unclear whether it is still in use. Surface dressings vary between formal dressings, single rows of stones outlining the graves and elongated stone cairns. Only a few headstones were noted. The earliest date observed was 1979 and the most recent 1985. Several of the graves are also associated with grave goods in the form of ceramic cups, mugs, saucers, consol jars and ceramic pots. All the graves are also oriented in an east-west direction and are in various stages of preservation.

It appears that the cemetery is still visited and at least one surface dressing consisting of stacked stones was replaced by a modern surface dressing.

Site BA03 consists of one unfenced grave on Portion 19/241 (**Figure 36**). The grave is located directly next to a dirt road and except for the headstone, no surface features were observed due to extremely dense vegetation cover. The inscriptions on the headstone, which is oriented in an east-west direction, is unclear. However, the date '1903' appears to be inscribed in the top left corner. It is unclear whether this grave is still visited. According to Mr. Visser (pers. Comm 2021), another grave is located in relatively close proximity to this grave, but due to the dense vegetation cover, is not visible. Also, grave site BA03 is indicated on the 1965 topographical map (**Appendix A: Figure 45**).

Table 4: Graves/cemeteries associated with the study area.

Name	Type	Source	Status	Estimates extent (m ²)	Parcel	Number of graves
BA01	Cemetery	Field	Intact	400	9/238	±26
BA03	Grave	Field	Intact	Unknown	19/241	+/-2



Figure 32: Formal surface dressing at Site BA01.



Figure 33: Upright stone serving as headstone at Site BA01.



Figure 34: Packed stones demarcating a grave at Site BA01.



Figure 35: Informal surface dressings at Site BA01.

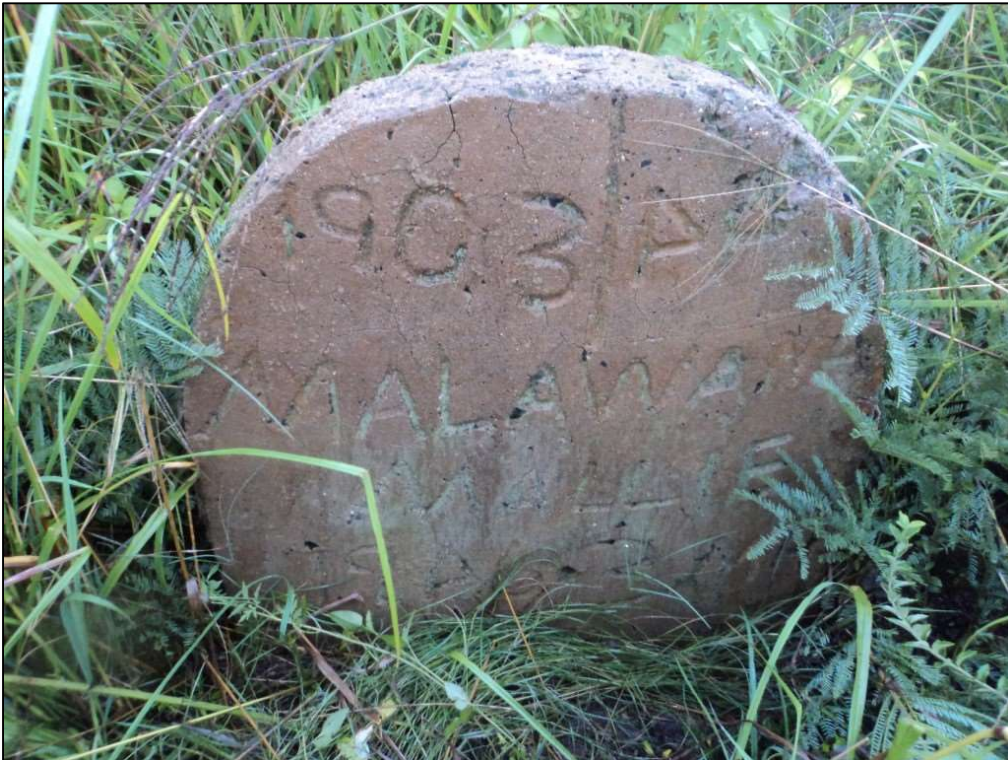


Figure 36: Grave at Site BA03.

Three of the heritage studies conducted in the area recorded the presence of cemeteries. See Van Schalkwyk (1997), Pelsler (2015) and Du Piesanie (2016).

6. Evaluation

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

6.1 Field Ratings

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 5: Field Ratings

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3 A	High	Mitigation not advised
Local	Grade 3 B	High	Part of site should be retained
General protection A	4 A	High/Medium	Mitigate site
General Protection B	4 B	Medium	Record site
General Protection C	4 C	Low	No recording necessary

Table 6: Individual site ratings

Site / Survey Point Name	Type	Rating	Field Rating/Grade	Significance	Recommendation
2629-BA01	Cemetery	Local	Grade 3 A	High	Mitigation not advised
2629-BA02	Building Ruins	4 B	Medium	Record site	4 B
2629-BA03	Grave	Local	Grade 3 A	High	Mitigation not advised
2629-BA04	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629-BA05	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629-BA06	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629-BA07	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629-BA08	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629-BA09	Demolished Building	General Protection C	4 C	Low	No recording necessary

*Note – These ratings are based on the specific surface infrastructure boundaries and are project specific – A change in these boundaries and/or activities will require the ratings to be revised.

7. Statement of Significance & Recommendations

7.1 Statement of significance

The study area: The Proposed Welgedacht Balloon Siding

The general area associated with the proposed Welgedacht Balloon Siding is considered to be significant from a heritage perspective since evidence of historical mining activity, demolished historical buildings and burial sites were recorded. Heritage studies in the surrounding areas also note the potential presence of LSA material, cemeteries and homesteads/structures dating from Late Farming Communities to the Historic period.

- Demolished historical sites falling outside of the areas demarcated for development.

Three of the Historical sites, (BA06, BA07, BA08) have been demolished, fall outside of the demarcated surface infrastructure area boundary and are not associated with material remains. Although potential subsurface culturally significant remains might exist, no impact is envisaged.

- **Demolished historical sites within or near areas demarcated for surface development.**

Three Historical sites (BA04, BA05, BA09) have been identified falling within or within close proximity of the areas demarcated for surface development. These sites have been demolished and are not associated with surface remains. Significant subsurface heritage material exceeding 60 years of age might be unearthed within the boundaries of the demarcated areas during the construction phase and could therefore be considered significant from a heritage perspective as such remains could be protected under the NHRA act 25 of 1999.

- **Building ruins within or near areas demarcated for surface development.**

Site BA02 falls within the boundary of the area demarcated for surface development and consists of historical building ruins dating to at least 1936. The building ruins were identified as the married quarters of the old Palmietkuil Mine that operated between 1910 and 1953. It is envisaged that Site BA02 will be impacted by the proposed construction of the railway siding as the layout places the railway line directly in the path of the site. Although Site BA02 exceeds 60 years of age and is therefore protected under the NHRA 25 of 1999, the buildings associated with the site have completely been demolished and currently consist of building rubble. Due to the state of the remains, the site is not considered to be significant from a heritage perspective.

- **Graves/Cemeteries located in the vicinity of the study area**

Two sites (BA01 & BA02) were identified as graves/cemeteries in the vicinity of the proposed siding. It is likely that cemetery BA01 contains graves older, as well as younger than 60 years and are significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply. It is unlikely that this site will be impacted on by the proposed development as it is located a significant distance from the proposed development, unless the road next to the cemetery will be used as an access road.

Site BA03 is located to the north of the proposed conveyor belt and directly next to a gravel road. The grave appears to exceed 60 years of age and is significant from a heritage perspective as the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act 25 of 1999 apply. It should also be noted that the possibility of another grave in close proximity of the recorded grave exists. It is unlikely that this site will be impacted on by the proposed development as it is located a significant distance from the proposed development, unless the road next to the grave will be used as an access road.

7.2 Recommendations

The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for development:

Preferred Conveyor Belt

- The majority of the Preferred Conveyor Belt route is located on cultivated land, while the eastern end of the route intersects Site BA09, an area that used be associated with buildings since at least 1953. The buildings formed part of a piggery, but were demolished in later years and are no longer associated with surface remains. Since subsurface culturally significant material might be located at Site BA09, the demarcated area is considered to be potentially sensitive. Care should therefore be exercised during the construction phase and should cultural material be discovered, a qualified archaeologist must be contacted.

Alternative Conveyor Belt

- The majority of the Alternative Conveyor Belt route is located on cultivated land. No sites of potential heritage significance were observed within close proximity of this route. The associated area is therefore not considered to be sensitive from a heritage perspective. From a heritage perspective, the Alternative Conveyor belt route is preferred.

Welgedacht Balloon Siding

- Site BA01, a cemetery consisting of approximately 26 graves, might be affected should the adjacent dirt road be used for access to the siding. It should be noted that the adjacent dirt road is an existing route that is currently being used for farming purposes. Should the dirt road be used as an access road, a fenced-off conservation buffer of 50 m must be established around the cemetery and a qualified archaeologist must compile a Conservation Management Plan to ensure the safeguarding of the graves. Also, access to the cemetery must not be refused.
- Site BA02 exceeds 60 years of age and is subsequently protected by the NHRA 25 of 1999. However, the buildings associated with this site have completely been demolished and currently consist of building rubble. The site is therefore not considered to be significant from a heritage perspective and the recording done is deemed to be sufficient.
- Site BA03 consists of a single grave directly next to a dirt road to the north of the study area. The dirt road is an existing route that is currently being used for farming purposes. Should this road be considered as an access route to the proposed siding, the grave could be impacted and the following is recommended: The vegetation surrounding the grave must be cut to verify the presence of additional graves. A fenced-off

conservation buffer of 50 m should also be established around the graves and a qualified archaeologist must compile a Conservation Management Plan to ensure the safeguarding of the graves. Access to the graves must not be refused. Alternatively, the graves may be relocated by a qualified graves relocation unit to a premises earmarked by the local municipality, but will set in motion a substantial process as new legislation will be triggered. These processes, however, must be performed in accordance with the involvement of community leaders and the relatives of the deceased buried at the concerned location.

- Sites BA04 and BA05 are considered to be potentially significant from a heritage perspective since these areas were associated with structures and buildings during historical times. Although surface indications are no longer present, subsurface cultural material might exist and care should therefore be exercised during the construction phase. Should cultural material be discovered, it is recommended that a qualified archaeologist be contacted.
- Sites BA06, BA07 and BA08, associated with demolished buildings, might potentially be significant from a heritage perspective since subsurface cultural material might exist. However, these sites are located outside of the proposed development footprint and are unlikely to be impacted. No further action is required.
- The area associated with the proposed railway line to northwest of the proposed siding is characterised by open veldt and dumping. A safety concern resulted in only certain sections of the proposed route being inspected. No potential sites of heritage significance, however, were noted during the inspection or on historical aerial imagery and topographical maps. The associated area is therefore not considered to be sensitive from a heritage perspective. Should potential heritage sites be observed during the proposed development, a qualified archaeologist must be contacted as soon as possible.

General Recommendations

- The above recommendations are based on the specific project activities and extents as indicated in the figures of this report. Should the proposed surface impact areas be changed, a qualified archaeologist must conduct a pedestrian survey on the new area and amend the report accordingly.
- Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the construction phase, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).

- From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency.

8. Conclusion

The proposed Welgedacht Balloon Siding project consists of surface infrastructure covering approximately 56 ha and a conveyor belt of between 2.72 km and 3 km. The Archaeological Impact Assessment examined the area and identified sites of cultural significance that might be impacted by the proposed development. These sites aided in the archaeological contextualisation of the general study area.

The AIA recorded nine sites that might be of heritage significance. The building ruins, potential subsurface remains and burial sites associated with these sites might be impacted by the proposed development as a result of surface and subsurface impacts by the proposed construction of the siding and conveyor belt.

The majority of the proposed conveyor belt route options fall on cultivated land that is not considered to be sensitive from a heritage perspective. However, the eastern end of the Preferred Conveyor belt route is located on a site that used to be associated with historical buildings. Although the buildings have been demolished, subsurface cultural material might still be present. Therefore, the Alternative Conveyor belt route is considered to be less sensitive from a heritage perspective and is therefore preferred.

The additional railway line proposed to the northwest of the study area is generally located on open veldt. Some sections could not be inspected due to a safety concern, but based on historical aerial imagery, historical topographical maps and the inspected sections, the associated area is not considered to be sensitive from a heritage perspective. Care, however, must be exercised during the construction phase of the project and if potential heritage sites are observed, a qualified archaeologist must be contacted as soon as possible.

The demolished sites intersected by the proposed siding are not likely to be impacted due to the disturbed state of the surface, but care should be exercised during the construction phase of the project since subsurface culturally significant material might be unearthed. Also, the proposed layout of the siding will impact the building ruins to the northwest of the siding. Although this site exceeds 60 years of age and is protected by the National Heritage Resources Act (25 of 1999), the buildings have been demolished and the remains are in a severely dilapidated state and are not considered to be significant from a heritage perspective. The cemetery to the north of the project area, as well as the grave to the northeast, might be impacted should the adjacent dirt roads be used for access to the siding. Conservation measures, therefore, include a conservation buffer and conservation management plan should these roads be utilised.

Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Welgedacht Balloon Siding project may proceed.

9. Addendum: Terminology

Archaeology:

The study of the human past through its material remains.

Artefact:

Any portable object used, modified, or made by humans; e.g. pottery and metal objects.

Assemblage:

A group of artefacts occurring together at a particular time and place, and representing the sum of human activities.

Context:

An artefact's context usually consist of its immediate *matrix* (the material surrounding it e.g. gravel, clay or sand), its *provenience* (horizontal and vertical position within the matrix), and its *association* with other artefacts (occurrence together with other archaeological remains, usually in the same matrix).

Cultural Resource Management (CRM):

The safeguarding of the archaeological heritage through the protection of sites and through salvage archaeology (rescue archaeology), generally within the framework of legislation designed to safeguard the past.

Excavation:

The principal method of data acquisition in archaeology, involving the systematic uncovering of archaeological remains through the removal of the deposits of soil and other material covering and accompanying it.

Feature:

An irremovable artefact; e.g. hearths or architectural elements.

Ground Reconnaissance:

A collective name for a wide variety of methods for identifying individual archaeological sites, including consultation of documentary sources, place-name evidence, local folklore, and legend, but primarily actual fieldwork.

Matrix:

The physical material within which artefacts is embedded or supported, i.e. the material surrounding it e.g. gravel, clay or sand.

Phase 1 Assessments:

Scoping surveys to establish the presence of and to evaluate heritage resources in a given area.

Phase 2 Assessments:

In-depth culture resources management studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required.

Sensitive:

Often refers to graves and burial sites although not necessarily a heritage place, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

Site:

A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity.

Surface survey:

There are two kinds: (1) unsystematic and (2) systematic. The former involves field walking, i.e. scanning the ground along one's path and recording the location of artefacts and surface features. Systematic survey by comparison is less subjective and involves a grid system, such that the survey area is divided into sectors and these are walked ally, thus making the recording of finds more accurate.

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National Heritage Resource Act No.25 of 1999, Government Gazette, Cape Town

Removal of Graves and Dead Bodies Ordinance No. 7 of 1925, Government Gazette, Cape Town

Appendix A: Historical Aerial Photographs and Topographical Maps

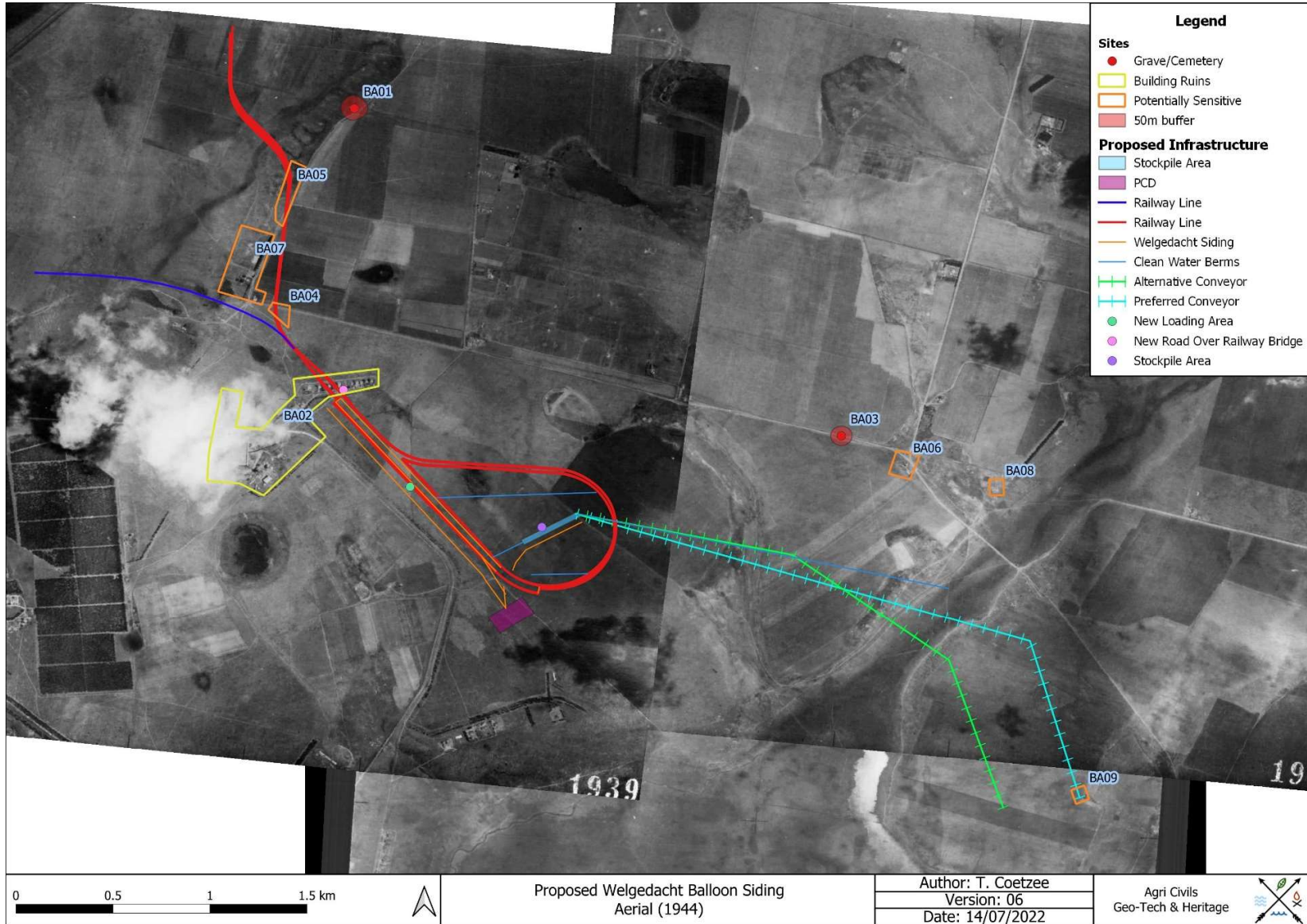


Figure 37: Study area superimposed on a 1944 aerial photograph.

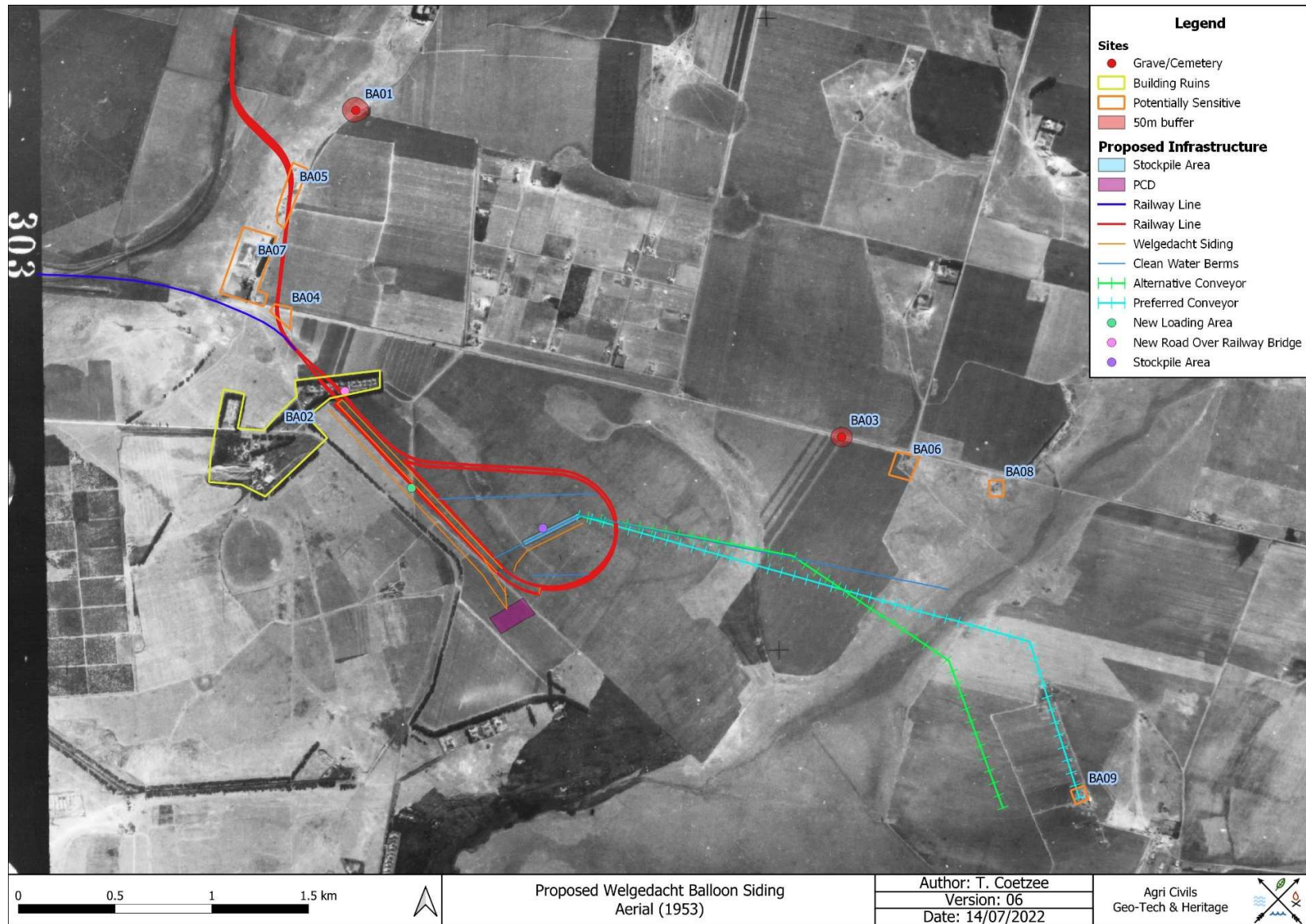


Figure 38: Study area superimposed on a 1953 aerial photograph.

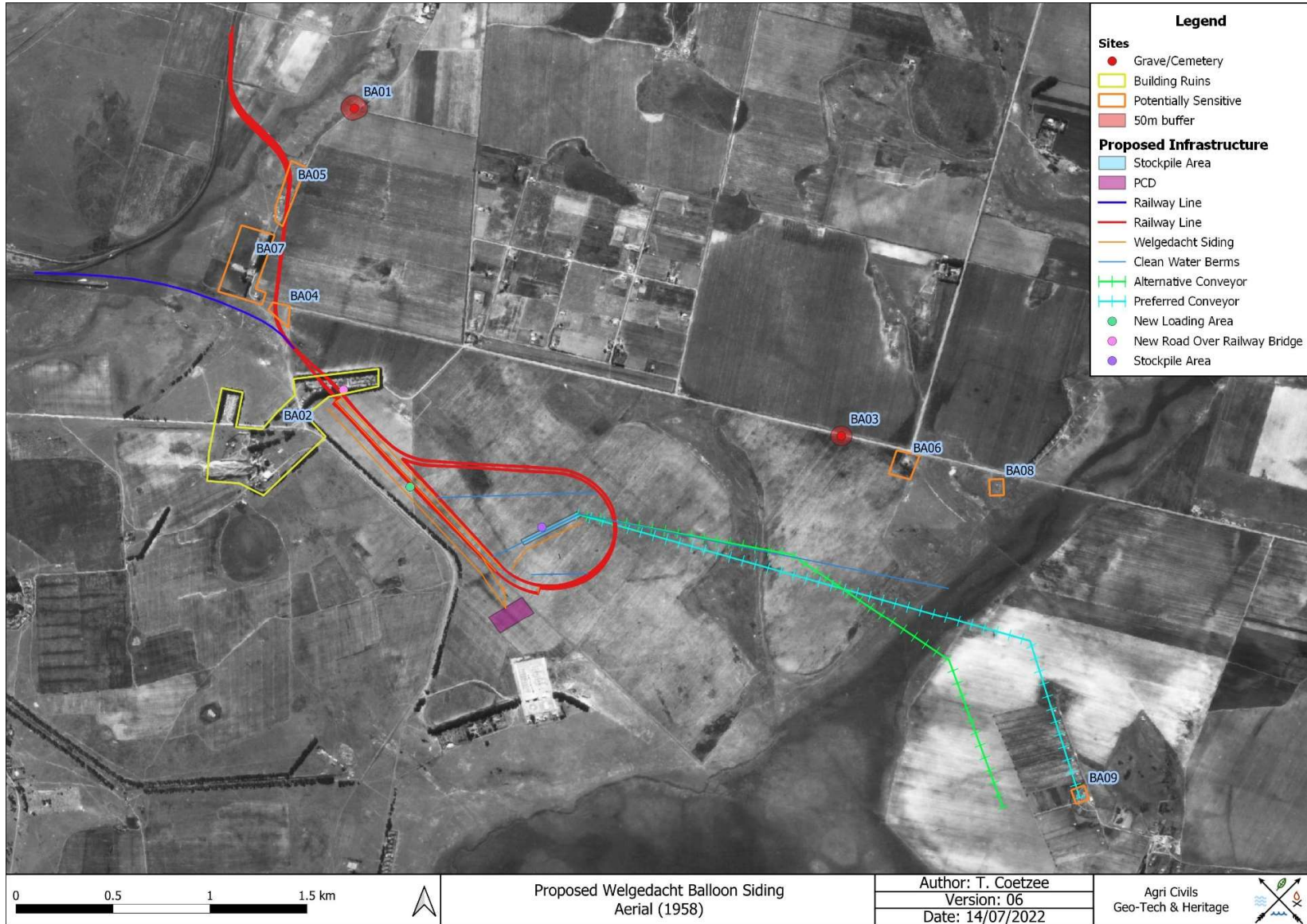


Figure 39: Study area superimposed on a 1958 aerial photograph.

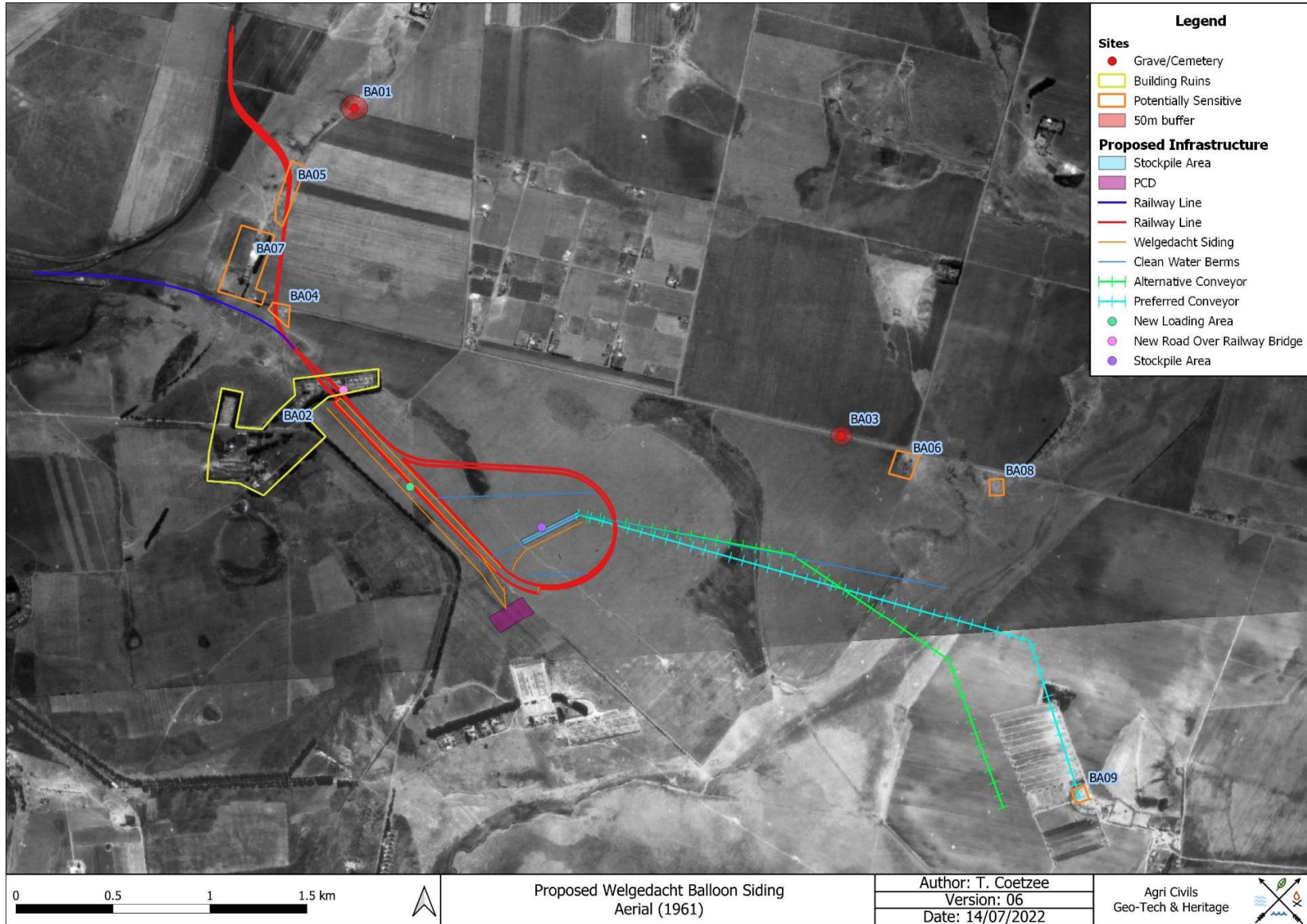


Figure 40: Study area superimposed on a 1961 aerial photograph.

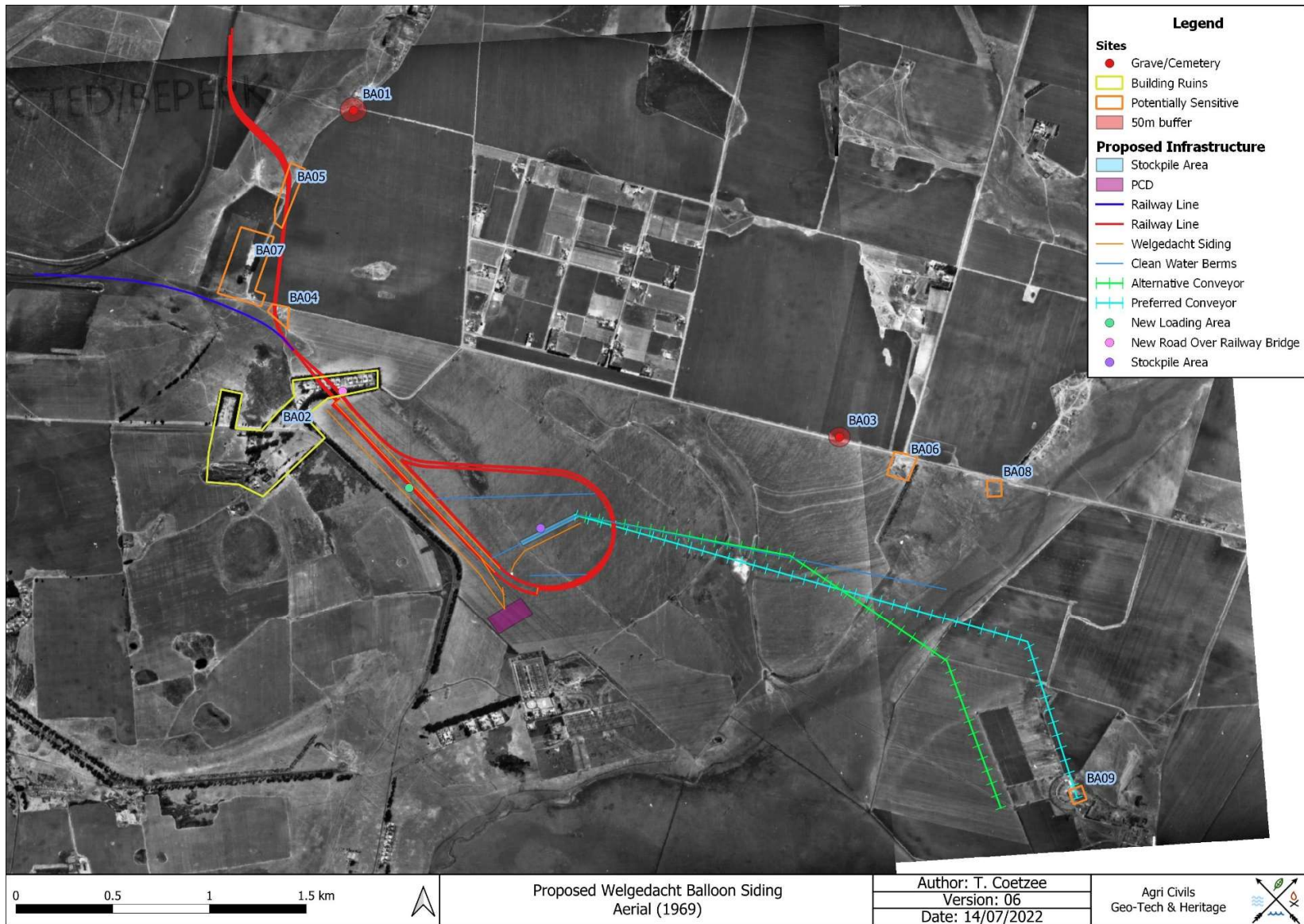


Figure 41: Study area superimposed on a 1969 aerial photograph.

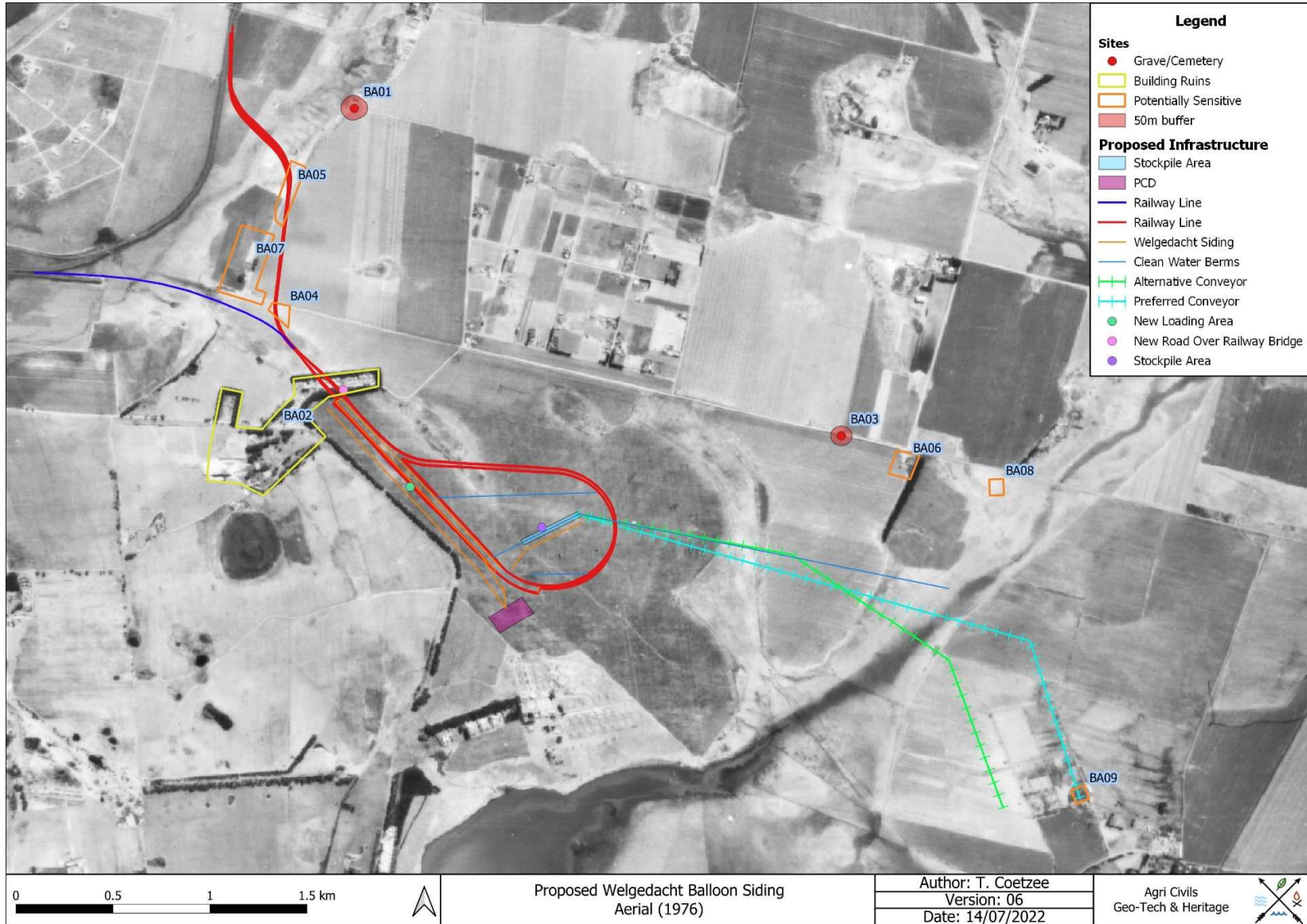


Figure 42: Study area superimposed on a 1976 aerial photograph.

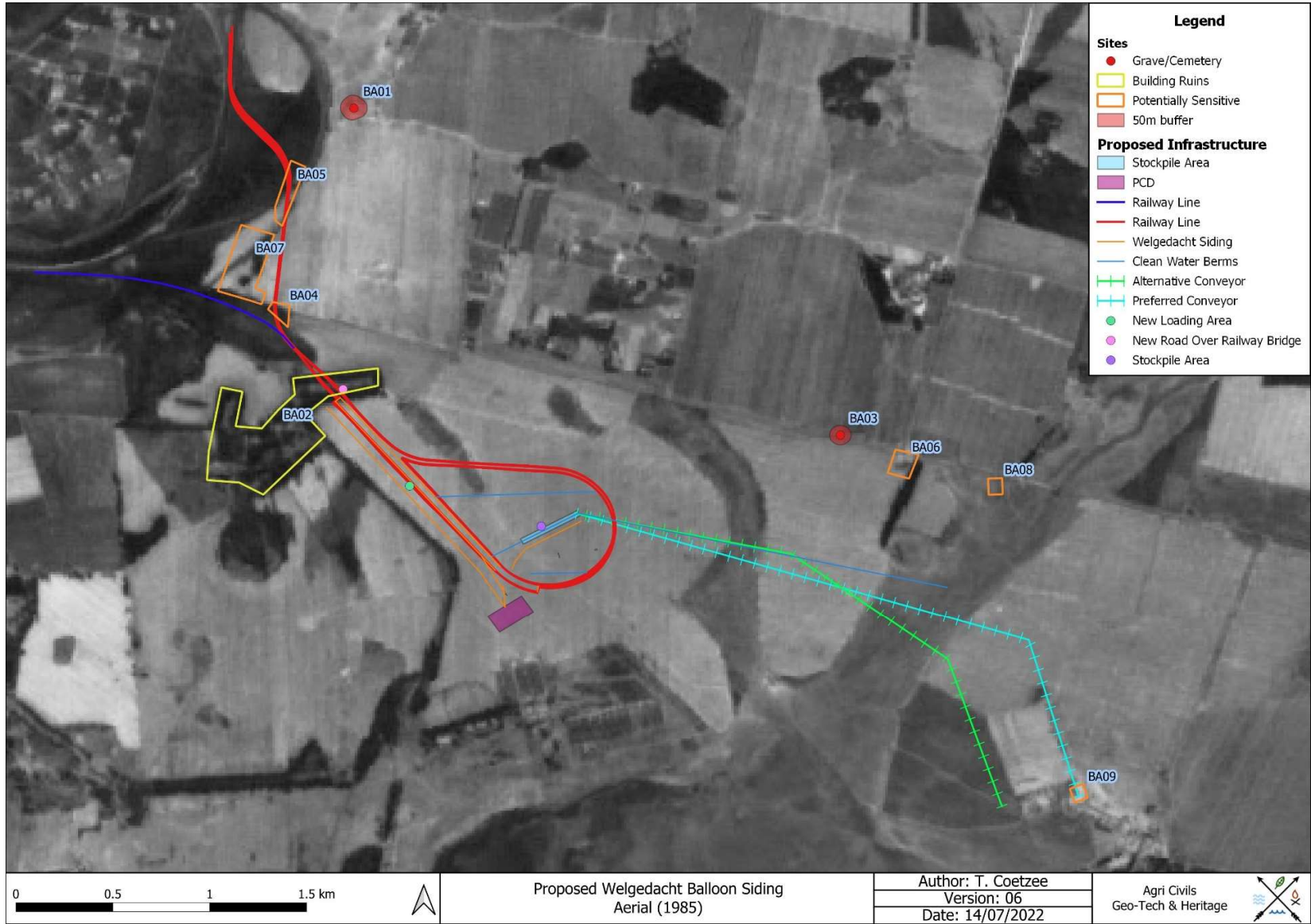


Figure 43: Study area superimposed on a 1985 aerial photograph.



Figure 44: Study area superimposed on a 1991 aerial photograph.

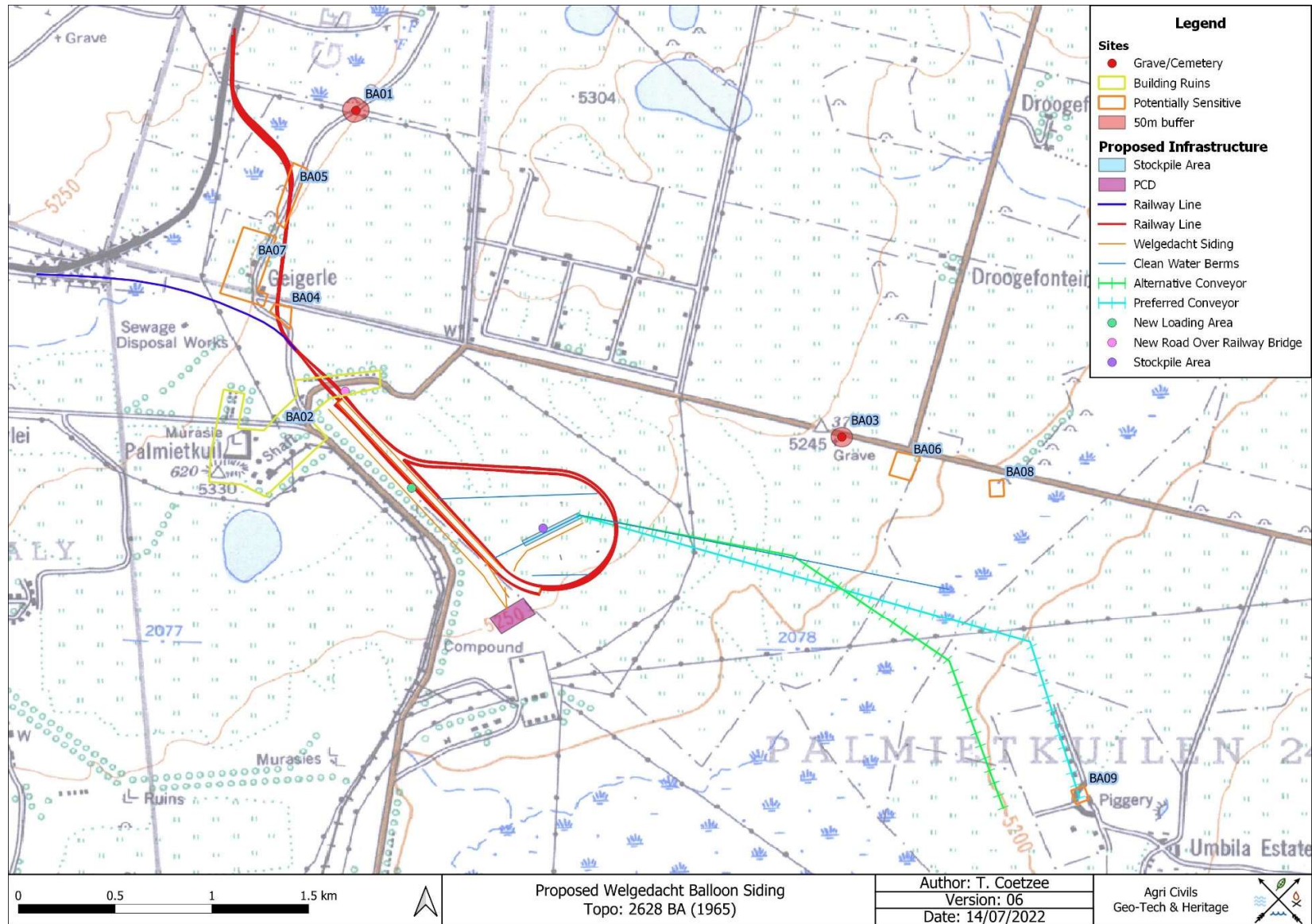


Figure 45: Study area superimposed on a 1965 topographical map.

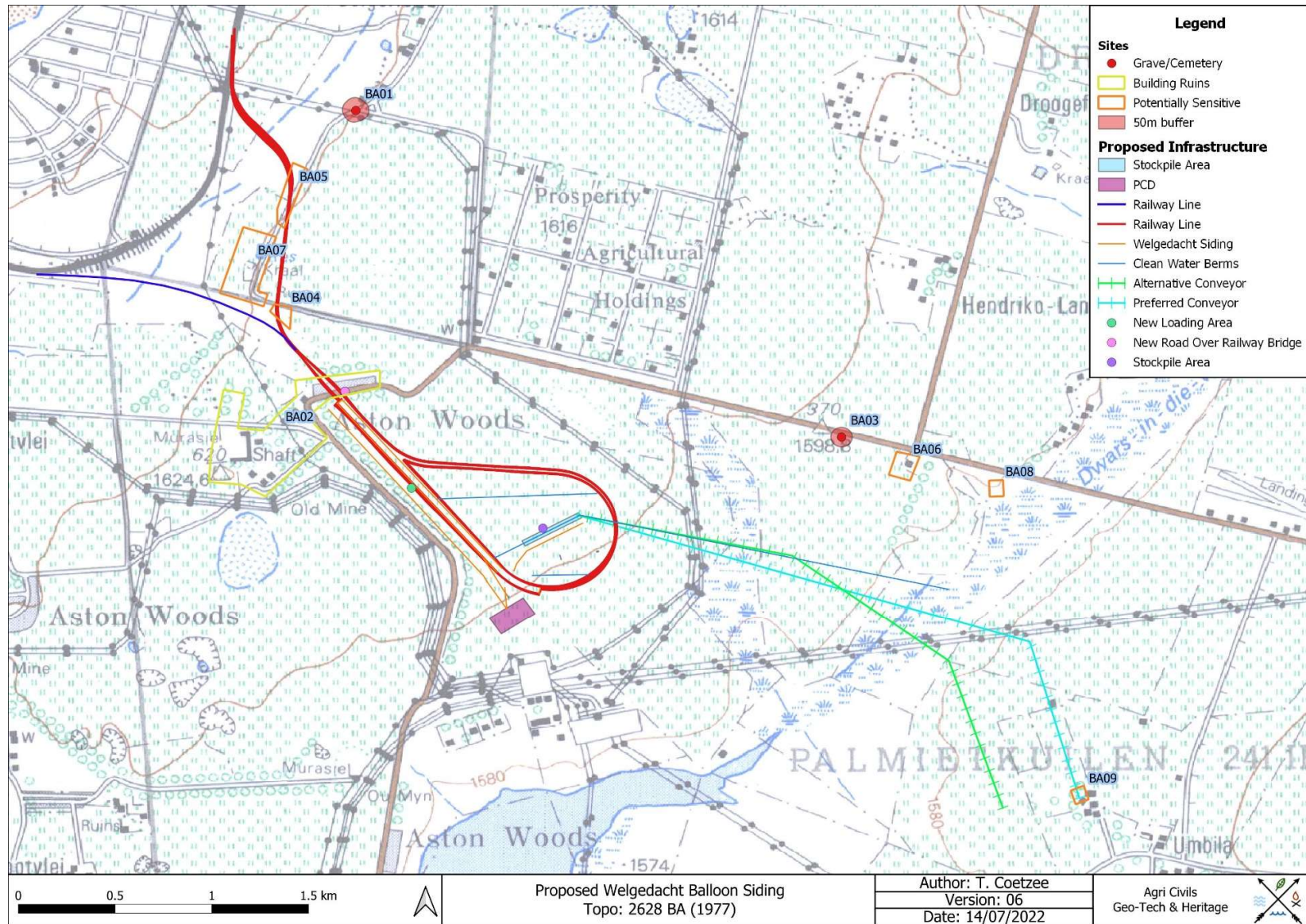


Figure 46: Study area superimposed on a 1977 topographical map.

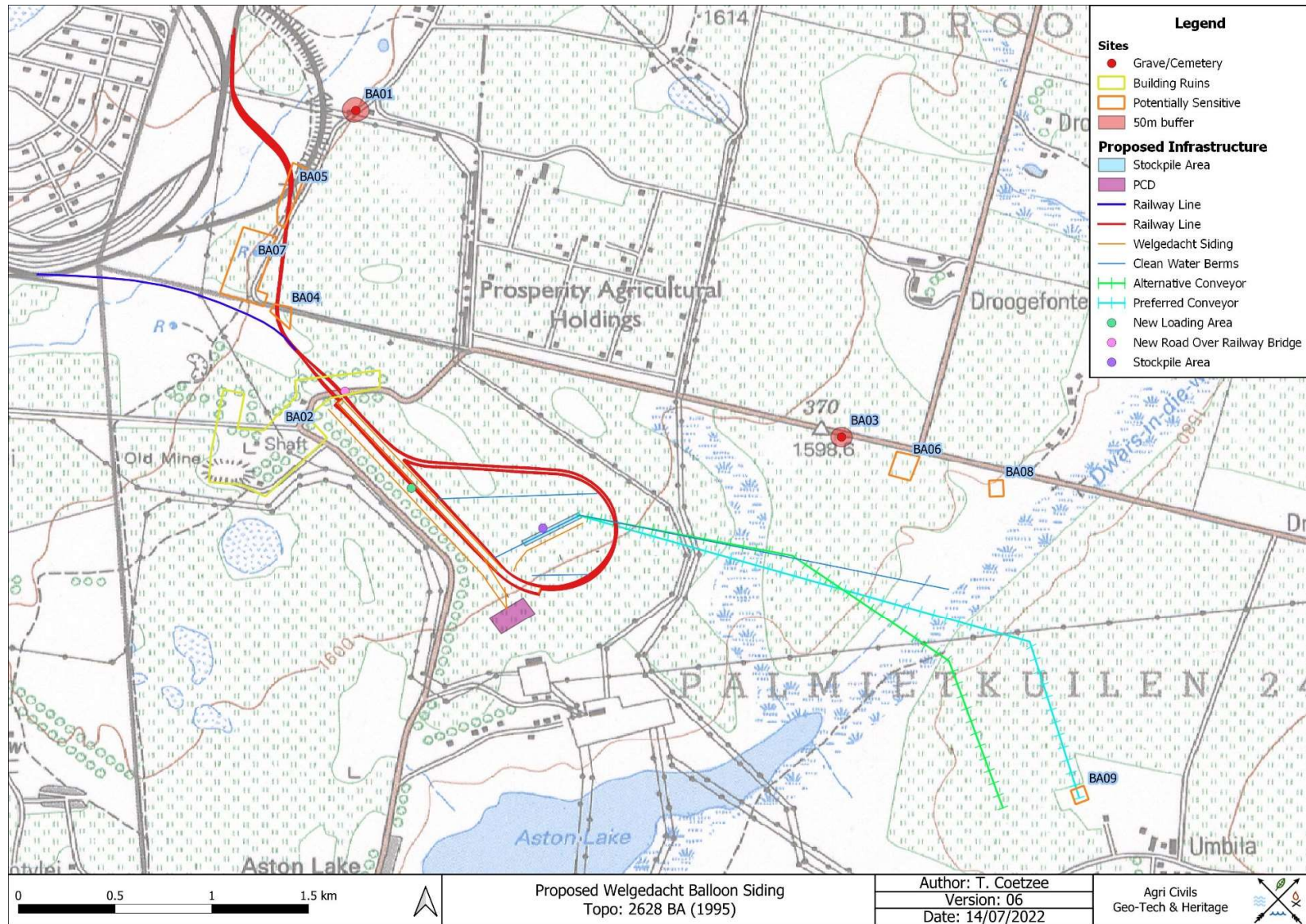


Figure 47: Study area superimposed on a 1995 topographical map.

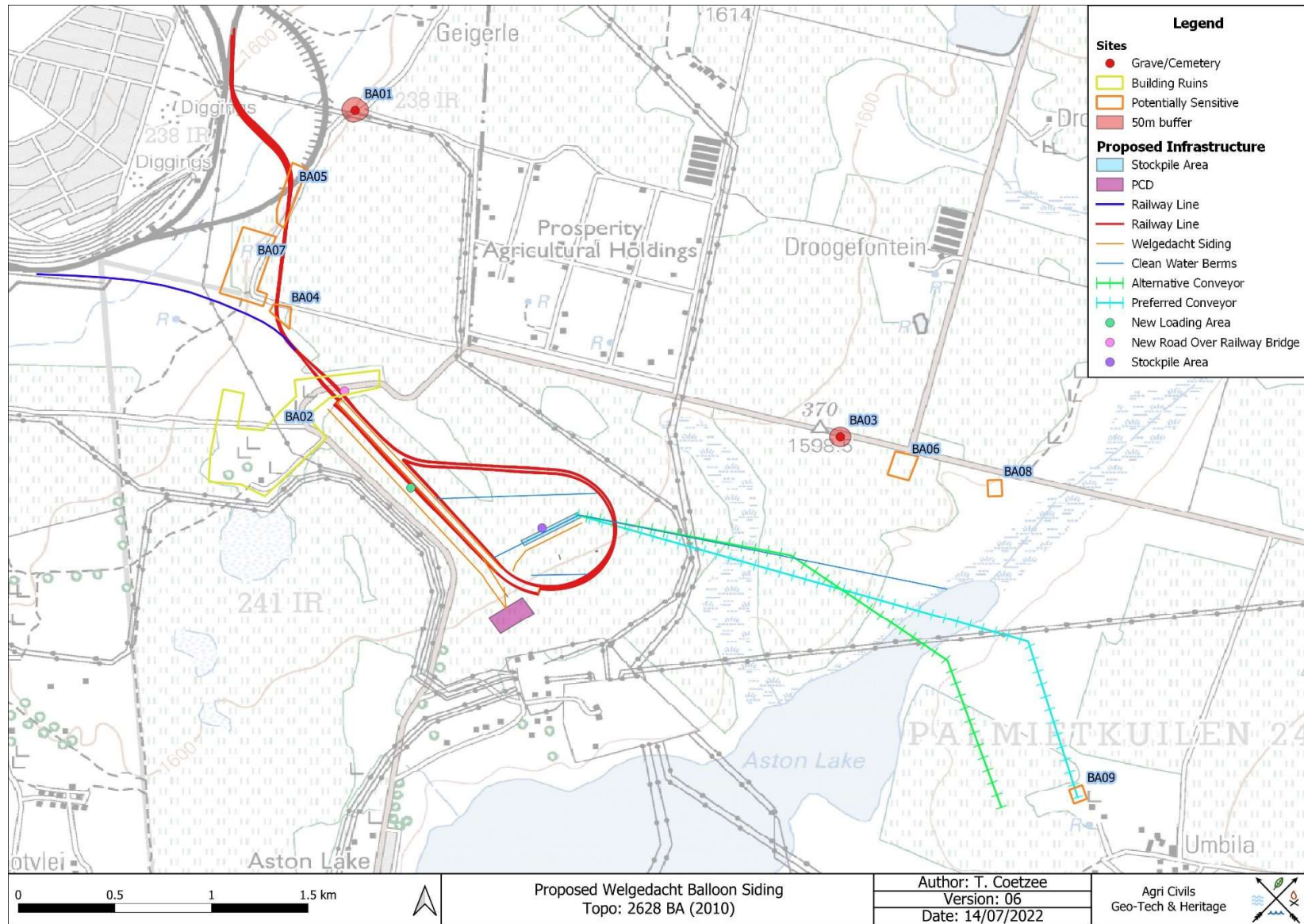


Figure 48: Study area superimposed on a 2010 topographical map.

Appendix B: Curriculum Vitae

Curriculum vitae

Tobias Coetzee

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Registered Professional Archaeologist, Association of Southern African Professional Archaeologists (ASAPA), CRM accredited, membership no: 289

Full names: Tobias Johannes Coetzee

Date of birth: 19 May 1986

Qualifications: MA (Archaeology)

Education:

- 2017 MA (Archaeology)
University of Pretoria
Dissertation: *Mapping Bokoni: Exploring Bokoni settlement choices and changes in Mpumalanga and Limpopo, South Africa using GIS site distribution analysis techniques*
- 2008 BA (Hons) (Archaeology)
University of Pretoria
Dissertation: *Mapping Bokoni towns & trade: Applying Geographic Information Systems to the articulation of Mpumalanga stonewalled sites with pre-colonial trade routes*
- 2006 – 2008 BA (Archaeology & Geography)
University of Pretoria
Subjects: Zulu, Afrikaans, Cartography, GIS and ArcGIS applications, Meteorology, Anthropology, Ancient History, Isotope Ecology and Dating, Computer and Information Literacy, Academic Skills and Introduction to research

Employment:

2020 – present	Heritage Practitioner Agri Civils Geo-Tech & Heritage
2013 – 2019	GIS Practitioner Bigen Group (Pty) Ltd
2013	Specialist consultant: Heritage Environmental Assurance (Pty) Ltd
2011	Junior lecturer in Archaeology at the University of South Africa (UNISA) at the department of Anthropology & Archaeology Primary lecturer for: The Prehistory of South Africa Assistant lecturer for: Applied Archaeology - Heritage Conservation
2009	Tutor Department of Anthropology & Archaeology, University of Pretoria

Conference papers, publications & Cultural Resources Management Reports:

Coetzee, T. 2020. *Conservation Management Plan for Cemetery 1 at the Kwagga North Mine, Middelburg, Mpumalanga*. Lydenburg: Agri Civils Geo-Tech & Heritage

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References:

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Appendix C: NEMA Risk Assessment Methodology

1.1 RISK ASSESSMENT

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. The receptors and resources are also identified, which allows for an understanding of the impact pathway and assessment of the sensitivity to change.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The values for the likelihood and consequence (severity, spatial scope and duration) of the impact are then used to determine whether mitigation is necessary.

1.1.1 Methodology used in Determining the Significance of Environmental impacts

The Environmental Impact Assessment (EIA) 2014 Regulations [as amended] promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), requires that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below

Extent of the impact		
The EXTENT of an impact is the physical extent/area of impact or influence.		
Score	Extent	Description
1	Footprint	The impacted area extends only as far as the actual footprint of the
2	Site	activity. The impact will affect the entire or substantial portion of the site/property.
3	Local	The impact could affect the area including neighbouring properties and transport routes.
4	Region	Impact could be widespread with regional implication.
5	National	Impact could have a widespread national level implication.
Duration of the impact		
The DURATION of an impact is the expected period of time the impact will have an effect.		
Score	Duration	Description
1	Short term	The impact is quickly reversible within a period of less than 2 y limited to the construction phase, or immediate upon the commencing of floods.
2	Short to medium term	The impact will have a short term lifespan (2–5 years).
3	Medium term	The impact will have a medium term lifespan (6 – 10 years)
4	Long term	The impact will have a medium term lifespan (10 – 25 years)
5	Permanent	The impact will be permanent beyond the lifespan of the development
Intensity of the impact		
The INTENSITY of an impact is the expected amplitude of the impact.		
Score	Intensity	Description
1	Minor	The activity will only have a minor impact on the affected environment in a way that the natural processes or functions are not affected.
2	Low	The activity will have a low impact on the affected environment.
3	Medium	The activity will have a medium impact on the affected environment function and process continue, albeit in a modified way.
4	High	The activity will have a high impact on the affected environment which be disturbed to the extent where it temporarily or permanently ceases
5	Very High	The activity will have a very high impact on the affected environment may be disturbed to the extent where it temporarily or permanently ceases

Reversibility of the impact

The REVERSIBILITY of an impact is the severity of the impact on the ecosystem structure

Score	Reversibility	Description
1	Completely reversible	The impact is reversible without any mitigation measures and management measures
2	Nearly completely reversible	The impact is reversible without any significant mitigation management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implementation of mitigation management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implementation of significant mitigation and management measures. Significant time resources required to ensure impact is on a controllable level.
5	Irreversible	The impact is irreversible.

Probability of the impact

The PROBABILITY of an impact is the severity of the impact on the ecosystem structure

Score	Probability	Description
1	Improbable	The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).
2	Low	The possibility of the impact occurring is very low, due either to circumstances, design or experience (5% to 30% of impact occurring).
3	Medium	There is a possibility that the impact will occur to the extent that provision must be made therefore (30% to 60% of impact occurring).
4	High	There is a high possibility that the impact will occur to the extent that provision must be made therefore (60% to 90% of impact occurring).
5	Definite	The impact will definitely take place regardless of any prevention plan and there can only be relied on migratory actions or contingency plans to contain the effect (90% to 100% of impact occurring).






Calculation of Impacts – Significance Rating of Impact

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact.

The significance of an impact is rated according to the scores as presented below:

Equation 1:

$$\text{Significance} = \text{Irreplaceability (Reversibility + Intensity + Duration + Extent)} \times \text{Probability}$$

Significance Rating		
Score	Significance	Colour Code
1 to 20	Very low	
21 to 40	Low	
41 to 60	Medium	
61 to 80	High	
81 to 100	Very high	
Mitigation Efficiency		
<p>Degree to which the impact can be mitigated: <i>The effect of mitigation measures on the impact and its degree of effectiveness:</i></p> <p><i>Equation 2:</i></p> $\text{Significance Rating} = \text{Significance} \times \text{Mitigation Efficiency}$		
High		0,2
Medium to High		0,4
Medium		0,6
Low to Medium		0,8
Low		1,0

Confidence rating: *Level of certainty of the impact occurring.*

- **Certain**
- **Sure**
- **Unsure**

Cumulative impacts: *The effect the combination of past, present and “reasonably foreseeable” future actions have on aspects.*

- Very Low cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

Appendix D: Monitoring – Heritage

Site type	Impact	Applicable Phase	Action	Frequency	Responsible person
Building remains – surface	Potential damage to surface / subsurface remains	Construction	Monitor subsurface material	Duration of construction	ECO
Demolished heritage sites with no surface remains	Potential damage to subsurface culturally significant material	Construction	Monitor subsurface material	Duration of construction	ECO
Graves / cemeteries	Potential damage to graves / cemeteries	Planning & Construction	Avoid graves / cemeteries. Unavoidable: Erect conservation buffer, CMP / Relocate	Once – planning	ECO
All surface impacts	Potential damage to subsurface culturally significant material	Construction	Monitor subsurface material	Duration of construction	ECO