

PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

For

**The Proposed Buffelsfontein
East Mining Project on
Portions 28, 35, 118, 119, 120,
128 and 139 of the Farm
Buffelsfontein 465 JQ, North
West**

Author ©:

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August 2021 – v2

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August 2023 – v4

A Phase 1 Archaeological Impact Assessment for the Proposed
Buffelsfontein East Mining Project on Portions 28, 35, 118, 119, 120, 128 and
139 of the Farm Buffelsfontein 465 JQ, North West

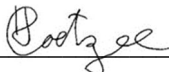
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I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Samancor Mining Expansion 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: 16 August 2023

List of Abbreviations

AIA – Archaeological Impact Assessment

CRM – Cultural Resource Management

DMRE – Department of Mineral Resources and Energy

EIA – Environmental Impact Assessment

EA – Environmental Authorisation

EMPr – Environmental Management Programme

ESA – Early Stone Age

GPR – Ground Penetrating Radar

GPS – Global Positioning System

ha – Hectare

HIA – Heritage Impact Assessment

km – Kilometre

LIA – Late Iron Age

LSA – Later Stone Age

m – Metre

MASL – Metres Above Sea Level

MEC – Member of the Executive Council

MPRDA – Mineral and Petroleum Resources Development Act

MSA – Middle Stone Age

MWP – Mining Works Programme

NEMA – National Environmental Management Act

NEMWA – National Environmental Management Waste Act

NHRA – National Heritage Resources Act

SAHRA – South African Heritage Resources Agency

WML – Waste Management Licence

NEMA Appendix 6

NEMA Specialist reports	
Item	Section / 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	P1, P2
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	P1, P2
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	P2
(c) an indication of the scope of, and the purpose for which, the report was prepared;	1.1, 2.2
(cA) an indication of the quality and age of base data used for the specialist report;	2.1, 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	2, 3.2
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	3
(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;	5, 7.1
(g) an identification of any areas to be avoided, including buffers;	P49
(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;	P49
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	3.2
(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;	5 – 7
(k) any mitigation measures for inclusion in the EMPr;	7.2
(l) any conditions for inclusion in the environmental authorisation;	7.2
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	7.2, Appendix C
(n) a reasoned opinion—	
(i)[as to] whether the proposed activity, activities or portions thereof should be authorised	7.2
(iA) regarding the acceptability of the proposed activity or activities; and	7.2
(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;	7.2, Appendix C
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	None

NEMA Specialist reports	
Item	Section / Page No
(p)a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(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 Buffelsfontein Opencast Mining Project on Portions 28, 35, 118, 119, 120, 128 and 139 of the Farm Buffelsfontein 465 JQ near Mooiooi in the North West Province. The proposed development falls within the Madibeng Local Municipality and the Bojanala District Municipality. The aim of the study is to determine the scope of archaeological resources that could be impacted by the proposed mining development.

The project area was initially assessed in 2021 during three site visits. Since the current project area falls within the initially assessed area, the previously identified sites were overlaid with the proposed development footprints in order to determine if the sites will be impacted by the proposed development.

During the initial assessments, Late Iron Age stone-walling and potsherds, a cemetery, historical building ruins and historical features were identified. Since dense vegetation hampered site visibility and free movement, the extent of the culturally sensitive area was determined through a combination of field recordings and the inspection of historical aerial imagery. This area is located to the south of the demarcated development footprints and will not be impacted by the proposed development.

The potential grave (B01) in the north-eastern section of the study area is at risk of being impacted by the proposed construction of a fence approximately 3.8 m to the south. Therefore, a fenced-off conservation buffer of 10 m should be erected around the potential grave. Alternatively, Ground Penetrating Radar operated by a suitably qualified heritage specialist may be employed to determine the presence of human remains. Another option is to initiate a grave relocation process.

Sites B02, B05 – B09, B11 and B15 consist of a combination of undiagnostic LIA pottery fragments and sections of stone-walling. These sites, however, generally occur in isolation, are associated with previously cultivated land and areas affected by previous mining activities. Therefore, the associated sites occur in a secondary context and are not considered to be significant from a heritage perspective. No further action is therefore required.

Sites S1 and S2-1 consisted of stone-walling. These sites, however, have subsequently been demolished by mining activities and are therefore not considered to be significant or sensitive from a heritage perspective.

Subject to adherence to the recommendations and approval by SAHRA, the proposed Buffelsfontein East Mining Project as per the indicated boundaries 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, No. 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 (AIA) for the proposed Buffelsfontein Opencast Mining Project on the Farm Buffelsfontein 465 JQ (**Table 1**) to the northeast of Mooi-nooi in the North West Province (**Figures 1 – 3**). The proposed activities fall within the Madibeng Local Municipality. 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 mine, 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. It should be noted that the project area was initially assessed in 2021 during three site visits. Since the current project area falls within the initially assessed area, the previously identified sites were overlaid with the proposed development footprints in order to determine if the sites will be impacted by the proposed development.

In the following report, the implications for the Samancor Chrome Ltd: Western Chrome Mines (Samancor) proposed Buffelsfontein East project located on Portions 28, 35, 118, 119, 120, 128 and 139 of the Farm Buffelsfontein 465 JQ with regard to heritage resources are discussed. The development is located on existing mining right areas (DMRE Ref. No. : NW 30/5/1/2/3/2/1/480 & 482 EM) and will consist of opencast mining methods and the associated infrastructure to the approximate extent of 57.84 ha and a fence measuring 2.4 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.

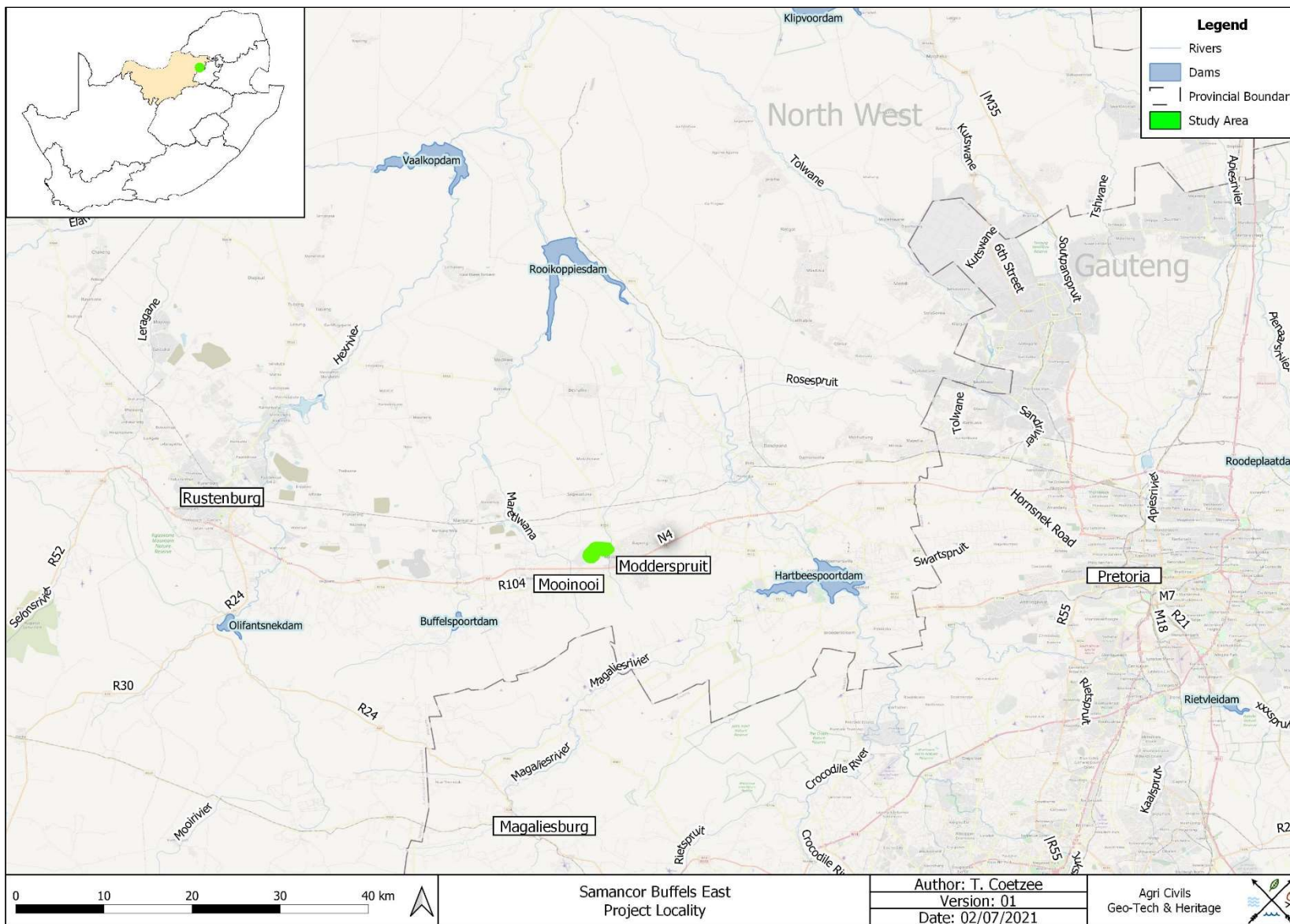


Figure 1: Regional and Provincial location of the study area.

1.2 Legislation

The South African Heritage Resources Agency 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 if triggered.

AIA's 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)*

Human Tissue Act and Ordinance 7 of 1925

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 (Member of the Executive Council) as well as the relevant Local Authorities. Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act (NHRA) as well as the Human Tissues Act, 1983.

2. Study Area and Project Description

2.1 Location & Physical Environment

The proposed Buffelsfontein East Mine is situated to the northeast of Mooi-nooi. The farm portions are listed below:

Table 1: Property name & coordinates

Property	Portion	Map Reference (1:50 000)	Lat	Lon	Parcel Size (ha)	Surveyed area (ha)	Proposed development
Buffelsfontein 465 JQ	20	2527 DA	-25.723113	27.637499	90.6	137.6	57.84 ha + 2.4 km (fence)
Buffelsfontein 465 JQ	35	2527 DA	-25.717888	27.605552	185.6		
Buffelsfontein 465 JQ	118	2527 DA	-25.723912	27.624633	43.8		
Buffelsfontein 465 JQ	119	2527 DA	-25.718233	27.631584	41.8		
Buffelsfontein 465 JQ	120	2527 DA	-25.713707	27.637765	38.6		
Buffelsfontein 465 JQ	128	2527 DA	-25.713530	27.630371	157.7		
Buffelsfontein 465 JQ	139	2527 DA	-25.723531	27.604706	29.7		
Total					587.8		

The study area is located 1.2 km northwest of Modderspruit, 7 km northeast of Mooi-nooi, 31 km north-northeast of Magaliesburg and 41 km east of Rustenburg (**Figures 1 – 3**). The study area falls within the Madibeng Local Municipality and the Bojanala District Municipality in the North West Province. In terms of vegetation, the study area falls within the Savanna Biome and Central Bushveld Bioregion. According to the vegetation classification by Mucina & Rutherford (2006) the study area falls within the Marikana Thornveld vegetation unit.

Marikana Thornveld is found in the North West and Gauteng Provinces only and occurs on the plains from Rustenburg in the west, through Marikana and Brits to the Pretoria area in the east. In terms of conservation, Marikana Thornveld is considered to be endangered with a conservation target of 19%. Less than 1% is statutorily conserved in the Magaliesberg Nature Reserve, while more is conserved in the De Onderstepoort Nature Reserve. Cultivation and urban or built-up areas transformed about 48% of the vegetation unit and erosion is generally low. Alien invasive plants generally occur in high densities along drainage lines (Mucina & Rutherford 2006).

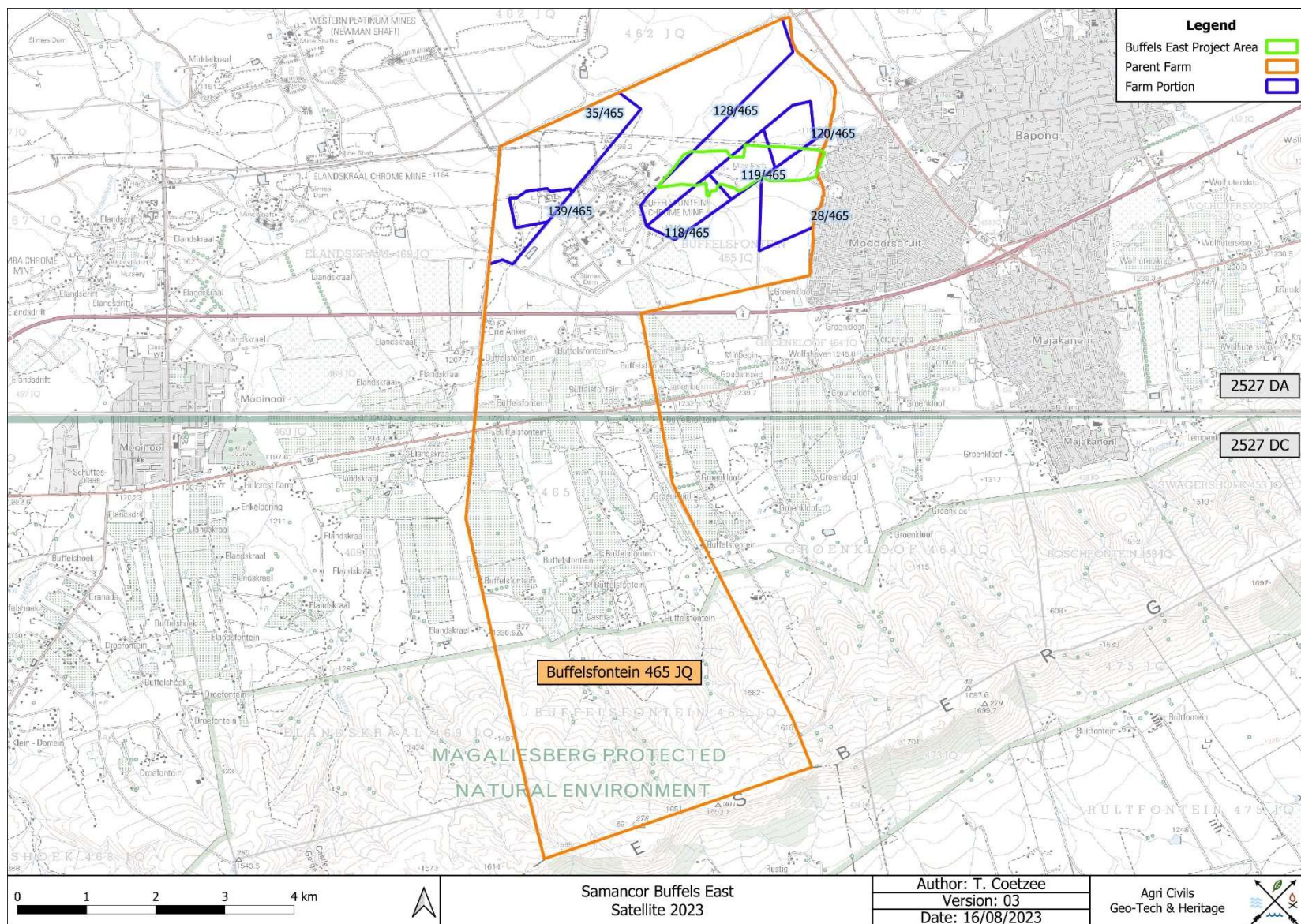
According to (Mucina & Rutherford 2006) the average elevation for Marikana Thornveld varies between 1050 and 1450 MASL (Metres Above Sea Level). The average elevation for the study area is 1200 MASL and slopes from the slightly more elevated south-western section towards the lower north-eastern area.

In terms of rainfall, the study area falls within the summer rainfall region and the average annual rainfall is roughly 626 mm. The average annual temperature is 18.9 °C. The average summer temperature is 23.1 °C, while the winter temperature averages 12 °C (Climate-data.org accessed 04/07/2021).

The study area falls within the Quaternary catchment A21J within the Crocodile West and Marico Water Management Area. The closest major rivers to the study area are Sterkstroom 15 km to the west and the Magalies River 14 km to the south. A non-perennial offshoot also forms the eastern boundary of portions 28 and 128 of the Farm Buffelsfontein 465 JQ. Buffelspoort Dam is located 16 km to the southwest and Hartbeespoort Dam 18 km to the southeast.

When the surrounding environment is considered, the general area is associated with mining activity to the west and northwest, and urban built-up areas to the east. Access to the study area is via local mining roads and tertiary roads turning from the N4 national road to the south (**Figures 2 & 3**). On a local scale, the area is associated with open veldt, as well as historical and contemporary mining activities.

Historical aerial images and topographical maps (**Appendix A**) show that a significant section of the study area has been disturbed by past cultivation and mining activities. The agricultural activities date to at least 1949 and the earliest mining activity to at least 1968. The earliest buildings were observed on the aerial image dating to 1962. However, the majority of these buildings have been demolished. Several stone-walled enclosures, although not very clear, were also observed on the early aerial images.



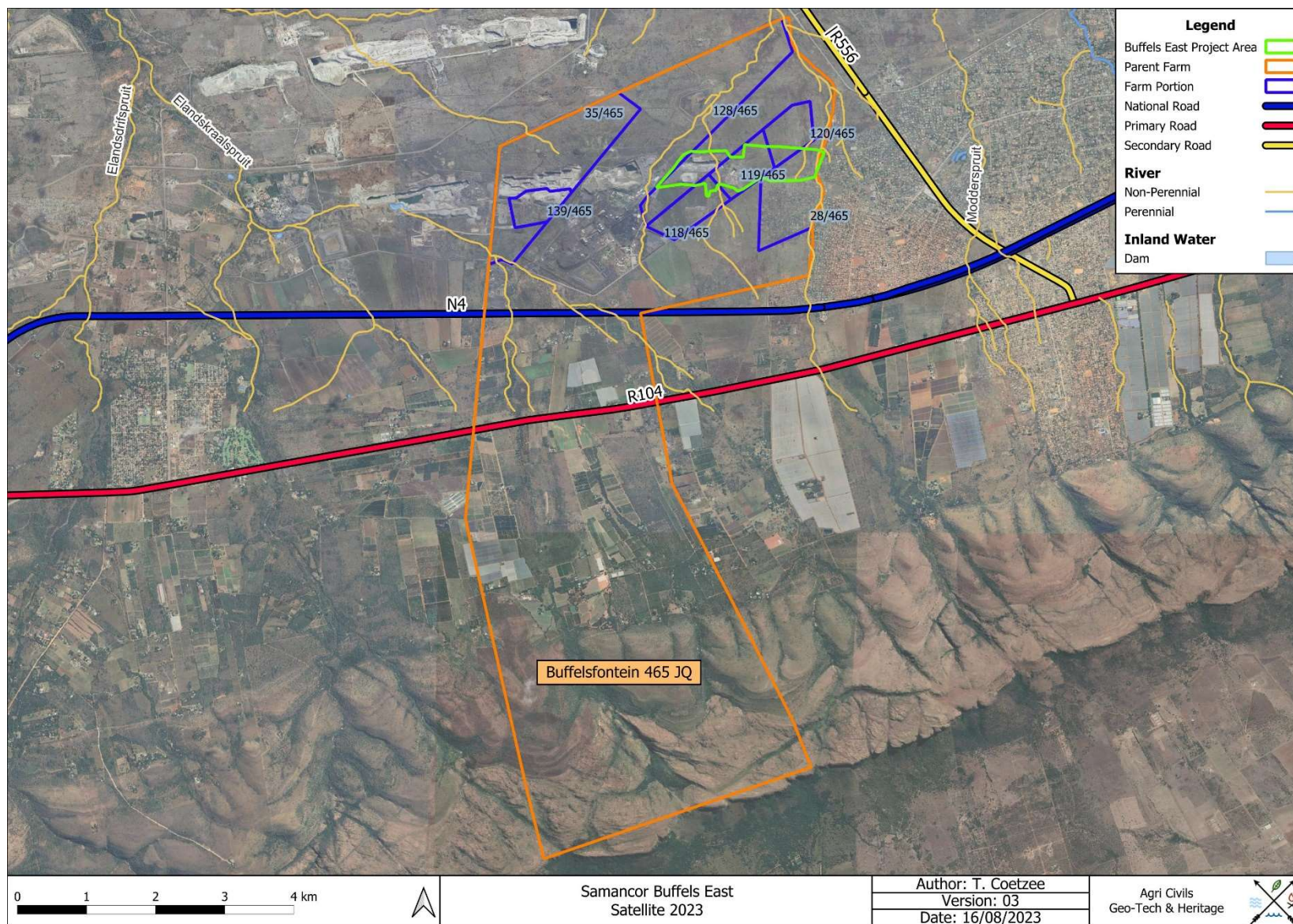


Figure 3: Satellite imagery of the study area and surrounding environment.

2.2 Project Description

The Samancor proposed Buffelsfontein East project is located on Portions 28, 35, 118, 119, 120, 128 and 139 of the Farm Buffelsfontein 465 JQ (**Figures 4 & 5**). The proposed impact area measures approximately 57.84 ha, while a fence of 2.4 km is proposed as well.

the Samancor Chrome Ltd: Western Chrome Mines (Samancor) proposed Buffelsfontein East project located on Portions 28, 35, 118, 119, 120, 128 and 139 of the Farm Buffelsfontein 465 JQ with regard to heritage resources are discussed. The development is located on existing mining right areas (DMRE Ref. No. : NW 30/5/1/2/3/2/1/480 & 482 EM) and will consist of opencast mining methods.

The following project description was provided by Elemental Sustainability (Pty) Ltd:

“Elemental Sustainability (Pty) Ltd. (Elemental) was appointed by Samancor Chrome Ltd Western Chrome Mine to submit an amendment application for the environmental authorisation (EA) in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Waste Management Licence (WML) in terms of National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) (NEMWA) as amended, and the Environmental Impact Assessment Regulations of 2014, as amended for the proposed activities at Buffelsfontein East. A Section 102 application in terms of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA) (Act 28 of 2002) was submitted to the Department of Mineral Resources and Energy (DMRE) to amend the Mining Works Programme (MWP) and the Environmental Management Programme (EMPr).

Mining at Buffelsfontein East (DMRE Ref. No.: NW 30/1/2/2/480MR) was undertaken with opencast and underground mining methods through two approved Environmental Management Programme’s (dated December 2001 and December 2008) and a Water Use License (January 2016). Opencast mining of chrome was approved for Pits A, B and C. The applicant commenced with mining of the approved chrome seams at Pit A. Pits C and B have not been mined.

Samancor Chrome Ltd proposes the following for Buffelsfontein East:

- *Mining of chrome seams that were not approved previously at Pit A, B and C*
- *Expansion of current approved stockpile areas*
- *Development of new stockpiles and infrastructure*

The expansion of the following infrastructure is proposed:

- *Opencast Pit A, B and C*
- *Overburden dump (west)*
- *Topsoil stockpile (west)*
- *Run of mine stockpiles (west)*

The following infrastructure is proposed for Buffelsfontein East:

- *Overburden dump (east)*
- *Topsoil stockpile (east)*
- *Crushing and screening stockpile area*
- *Offices and workshops (east)*
- *Access and haul roads (east)*
- *Parking/ test ramp*
- *Hardpark”*

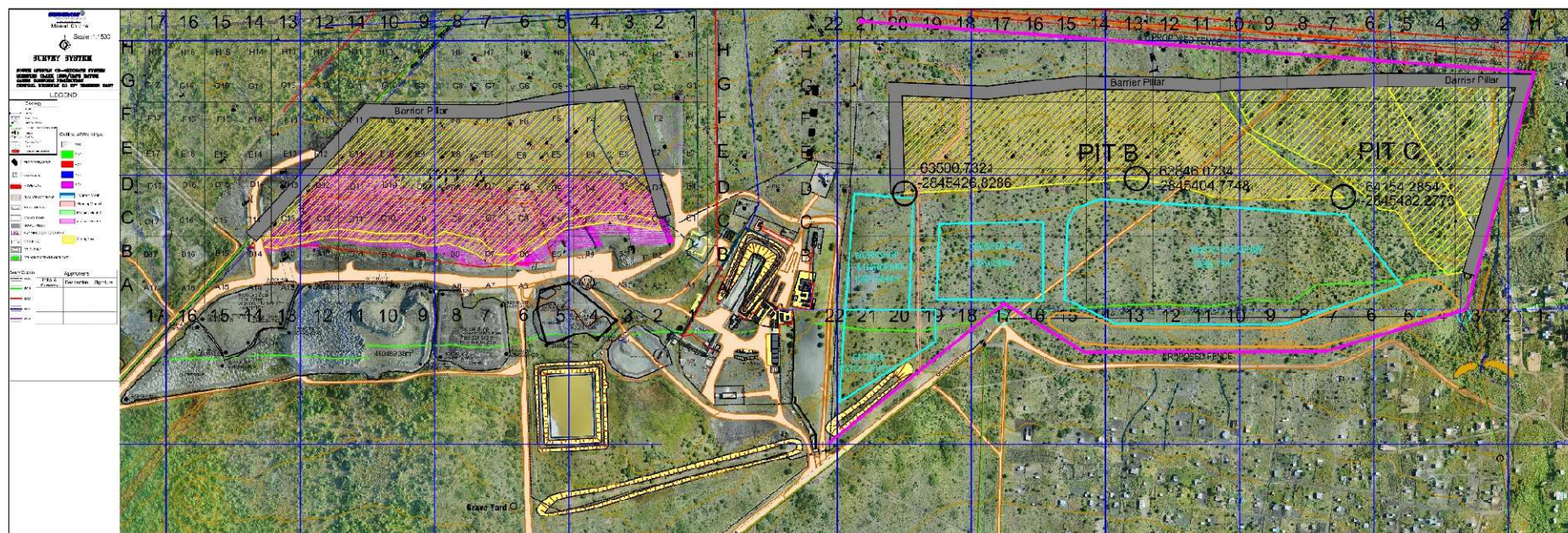


Figure 4: Buffels East Proposed Layout (Supplied by Elemental Sustainability 2023).

3. Methodology

The proposed project area falls within an area assessed in 2021 (see Coetzee 2021). Therefore, the previously identified sites were overlaid with the proposed development footprints in order to determine if the sites will be impacted by the proposed development. Archaeological reconnaissance of the study area was conducted during April, June and August 2021 through a combination of unsystematic and systematic pedestrian surveys (**Figure 5**). During the first site visit in April, extremely dense vegetation that completely prevented free movement and significantly hampered visibility was encountered. A section could therefore not be surveyed. Following the first site visit, a section of the dense grass directly to the south of the proposed development was cut in order to allow site detection and movement. The second site visit was conducted in June and focussed on the section of the study area where the grass was cut. A large cemetery and several stone walls associated with potsherds were identified within the section of slashed grass. A sensitive area was delineated from a combination of field observations and inspecting historical aerial images.

General site conditions were recorded via photographic record (**Figures 6 – 13**). Also, the entire project area was inspected on Google Earth, historical aerial imagery and topographical maps in order to identify potential heritage remains (**Appendix A**). Sixteen sites or instances where cultural remains were observed were recorded during the pedestrian survey. It should be noted that due to the high concentration of recordings, Site B16 represents all the LIA related instances observed within the demarcated sensitive area. The three heritage sites listed in the previous heritage study conducted by Pelser & Van Vollenhoven (2008) are also listed (**Table 2**).

The prefix '2527DA' is not used when referring to the site names due to the length of the name, but is recorded as such in **Tables 2 & 7**. The topographical datasets dating to 1943, 1968, 1979, 1980, 1985, and 2010, as well as the historical aerial photographs dating to 1949, 1962, 1964, 1968 and 1985 proved useful in terms of providing an indication of the location and age of some of the buildings, structures and features associated with the study area. The total area inspected was roughly 137.6 ha. Since heritage resources are often associated with perennial and non-perennial rivers, the rivers and streams located within close proximity of the study area were buffered by a distance of 500 m, indicating a potentially sensitive area (**Figure 51**).

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 area 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 Name	Longitude	Latitude	Description	Age
B01	2527DA-B01	27.638750	-25.716031	Potential Grave	Unknown
B02	2527DA-B02	27.638777	-25.719676	Pottery	LIA
B03	2527DA-B03	27.625253	-25.720425	Angular Structure	Historical
B04	2527DA-B04	27.625741	-25.720386	Circular Structure	Historical
B05	2527DA-B05	27.638635	-25.716138	Stone-walling	LIA
B06	2527DA-B06	27.627248	-25.716554	Pottery	LIA
B07	2527DA-B07	27.629302	-25.717252	Stone-walling	LIA
B08	2527DA-B08	27.635904	-25.715727	Stone-walling	LIA
B09	2527DA-B09	27.637418	-25.716683	Pottery	LIA
B10	2527DA-B10	27.624536	-25.722820	Cemetery	Historical
B11	2527DA-B11	27.624093	-25.724685	Pottery	LIA
B12	2527DA-B12	27.623628	-25.720701	Angular Structure	Historical
B13	2527DA-B13	27.622077	-25.722133	Angular Structure	Historical
B14	2527DA-B14	27.621944	-25.722149	Potential Midden	Historical
B15	2527DA-B15	27.618657	-25.725247	Pottery	LIA
B16	2527DA-B16	27.622949	-25.723075	Stone-walling	LIA
S1	S1	27.630849	-25.720626	Stone-walling (Previous HIA)	LIA
S2-1	S2-1	27.627210	-25.720699	Stone-walling (Previous HIA)	LIA
S2-2	S2-2	27.626638	-25.722017	Stone-walling (Previous HIA)	LIA

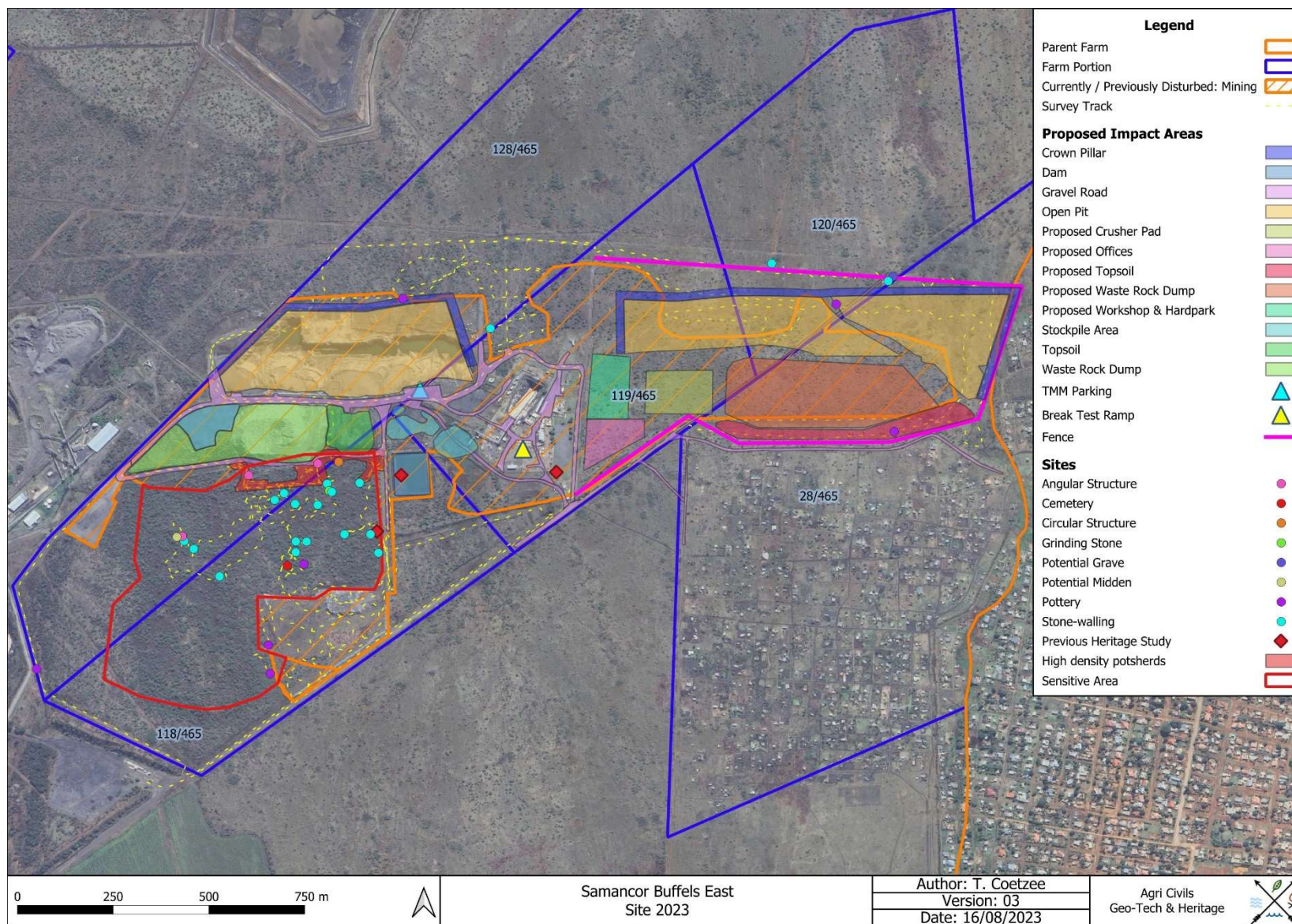


Figure 5: Study area with recorded sites portrayed on a 2023 satellite image.



Figure 6: Environment in the north-western corner of the study area.



Figure 7: Environment along the northern boundary of the study area.



Figure 8: Environment in the north-eastern corner of the study area.



Figure 9: Environment along the eastern boundary of the study area.



Figure 10: Area utilised for cattle grazing along the south-eastern boundary.



Figure 11: Environment to the south of the proposed development area.



Figure 12: Environment to the southwest of the proposed development area.



Figure 13: Current mining development.

3.1 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 and were photographed with a Samsung S7 mobile phone.

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.

3.1.1 Previous Heritage Studies

Buffelsfontein East & West Expansion Project

A Heritage Impact Assessment was conducted by Pelser & Van Vollenhoven (2008) for the initial Buffelsfontein East and West mining expansion on the Farm Buffelsfontein 465 JQ. The surface impact for the initial project, however, was significantly smaller compared to the proposed project. The study recorded one angular stone-walled enclosure and an extensive LIA stone-walled site. It was assumed that the angular enclosure (S1) was likely to relate to recent quarrying and mining activities and was considered to be of low significance. The site was subsequently demolished. The LIA stone-walled site (S2) was determined to be highly significant as this site appears to form part of larger complex that was identified by Dr Julius Pistorius. Accordingly, the site is associated with the ancestors of the Tswana and dates from the 17th Century onwards. Material culture observed during their survey included hut enclosures, middens etc. Due to the site already being impacted and the possibility of future expansion, the HIA proposed a detailed mapping and drawing of the site, as well as archaeological excavations. An alternative consisting of the fencing-off of the site and compiling a management plan was proposed as well. These measures, however, were not implemented and sections of the site have been demolished by mining activities.

3.2 Limitations

The majority of the area to the south of the current mining activity is characterised by extremely dense vegetation cover (**Figure 14**), while the remaining areas consist of less dense vegetation. A section of grass to the south of the current mining activity was cut and revealed several stone-walled enclosures and a cemetery (**Figure 15**). A significant section, however, remains to be surveyed and was demarcated as sensitive. This area, however, will not be impacted by the proposed development. No field assessment occurred since 2021 and the current condition of the demarcated area is unknown. The updated recommendations are therefore based on satellite imagery dating to 2023.



Figure 14: Dense vegetation associated with the area to the south of the proposed impact areas.



Figure 15: Section of cut grass to the south of the current mining development (June 2021).

4. 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.

4.1 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).

4.2 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.

In terms of general project area, the region is well known for LIA sites. The area west of Wonderboompoort is associated with one of the earliest LIA sites. Further to the west a high concentration of sites is also found that stretches to Olifantspoort in the Magaliesberg. These sites date to the Moloko period that roughly stretched from AD 1100 – 1500 (Van Vollenhoven 2006).

A later Ndebele invasion that was led by Mzilikaze in 1827, settled at Kungwini, present day Wonderboom in Pretoria North. In 1832, the Zulu king Dingane attacked Mzilikaze at Kungwini. According to Van Vollenhoven (2006), the Sotho-Tswana groups are the largest Bantu language speaking people who are formed by the Northern and Southern Sotho, as well as the Tswana. These groups are responsible for large stone-walled towns and according to oral histories, these groups re-established themselves after the 1827 arrival of Mzilikaze during the Mfecane/Difaquane.

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 16 – 18** below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

The archaeological study conducted by Pelsaer & Van Vollenhoven (2008) did not locate Stone Age artefacts.

According to Bergh (1999: 5), several LSA sites are located in the Magaliesberg between Pretoria and Brits: Rissik, Jubilee Shelter, Silkaatsnek, Elizabeth Shelter, Cave James, Seprent Quarry, Xanadu, Hope Hill Shelter, Kloofendalskuiling. Another LSA site, Krugergrot, is located between Brits and Rustenburg.



Figure 16: ESA artefacts from Sterkfontein (Volman 1984).

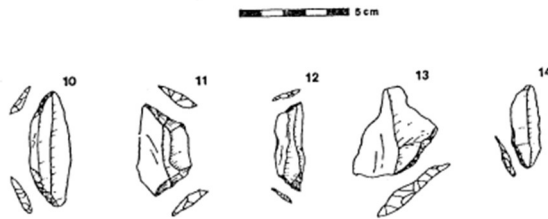


Figure 17: MSA artefacts from Howiesons Poort (Volman 1984).



Figure 18: LSA scrapers (Klein 1984).

5.2 Iron Age Farmer Remains

The area to the south of the demarcated development footprints is associated with a high concentration of LIA sites. The stone-walled site first observed by Pelsers & Van Vollenhoven (2008), and labelled as S-1 and S-2, appears to continue further to the west than initially mentioned. The area marked as 'Sensitive' on **Figure 51** consists of several sites associated with LIA material culture and were therefore not labelled individually. The site number 'B16' was assigned to the collection of recorded instances falling within this boundary. The extent of the boundary was determined from a combination of historical aerial images and field observations. Access to the southern section of this area, however, could not be obtained due to dense vegetation cover. **Table 3** lists the observed instances of material culture dating to the LIA, while **Figures 19 – 35** indicate the photographed remains. It should be noted that sites S1 and S2-1 have completely been demolished by mining activities and that no infrastructure is planned for the demarcated 'Sensitive' area.

The LIA sites to the north of the study area (B02, B05, B06, B07, B08, B09), as well as Sites B11 and B15 to the south, appear to be associated with a disturbed context since historical aerial imagery (**Appendix A**) indicate the areas to be partially cultivated / disturbed by mining activities. Based on the proposed layout, only sites B02, B06 and B09 fall within the proposed development footprint, while sites B05, B07, B08, and B15 fall outside of the development footprint.

Table 3: Iron Age sites.

Name	Type	Source	Status	Age	Estimated extent	Parcel
B02	Pottery	Field	Intact	LIA	± 1 m ²	25
B05	Stone-walling	Field	Intact	LIA	± 8 m	120
B06	Pottery	Field	Intact	LIA	± 1 m ²	128
B07	Stone-walling	Field	Intact	LIA	± 3 m	119 & 128
B08	Stone-walling	Field	Intact	LIA	± 3 m	120
B09	Pottery	Field	Intact	LIA	± 1 m ²	120
B11	Pottery	Field	Intact	LIA	± 1 m ²	120
B15	Pottery	Field	Intact	LIA	± 1 m ²	128
B16	Stone-walling	Field	Intact	LIA	± 27.7 ha	118 & 128
S1	Stone-walling, Pottery	Previous Heritage Study	Demolished	LIA	Unknown	119
S2-1	Stone-walling, middens, etc.	Previous Heritage Study	Demolished	LIA	Unknown	118
S2-2	Stone-walling, middens, etc.	Previous Heritage Study	Intact	LIA	Unknown	118



Figure 19: Potsherd at Site B02.



Figure 20: Stone-walling at Site B05.



Figure 21: Potsherd at Site B06.



Figure 22: Dilapidated stone-walling at Site B07.



Figure 23: Dilapidated stone-walling at Site B08.



Figure 24: Potsherd at Site B09.



Figure 25: Potsherd at Site B11.



Figure 26: Potsherd at Site B15.



Figure 27: Stone-walling at Site B16.



Figure 28: Exposed stone-walling at Site B16.



Figure 29: Upper grinding stone at Site B16.



Figure 30: Undecorated Potsherds at Site B16.

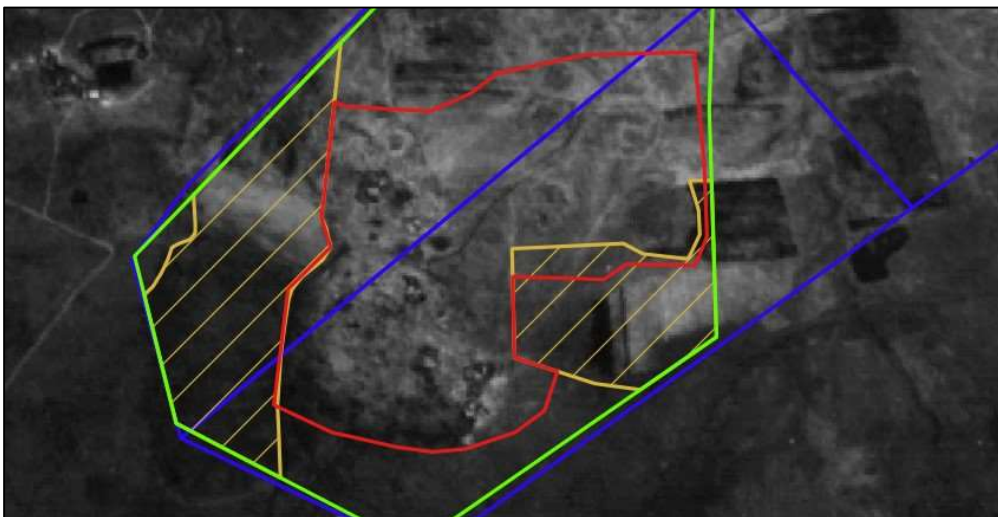


Figure 31: Rough indication of the extent of stone-walled Site B16 as seen on a 1949 aerial image.



Figure 32: Stone-walling observed at Site S2-2.



Figure 33: LIA potsherds near historical Site B13.



Figure 34: Undecorated potsherd at the disturbed high-density area directly south of the current mining activities.



Figure 35: Decorated potsherd at the disturbed high-density area directly south of the current mining activities.

The archaeological study conducted for the previous Samancor Buffels East and West projects recorded several similar LIA sites (Pelser & Van Vollenhoven 2008).

5.3 Historical

Five historic sites were identified during the pedestrian survey (**Table 4**). These sites fall within the demarcated sensitive area and the majority have been demolished (**Figures 36 – 42**). Based on the proposed layout, these sites are located to the south of the demarcated development footprints and no impact is foreseen.

Table 4: Historic sites

Name	Type	Source	Status	Age	Estimates extent	Parcel
B03	Angular Structure	Field	Demolished	Historic	±30 m ²	128
B04	Circular Structure	Field	Intact	Historic	± 5 m ²	118
B12	Angular Structure	Field	Demolished	Historic	± 25 m ²	128
B13	Angular Structure	Field	Demolished	Historic	± 9 m ²	128
B14	Potential Midden	Field	Demolished	Historic	± 4 m ²	128



Figure 36: Demolished building at Site B03.



Figure 37: Material remains associated with Site B03.



Figure 38: Circular stone structure at Site B04 possibly used for housing a water tank.



Figure 39: Similar circular stone structure to Site B04.



Figure 40: Angular building foundation at Site B12.



Figure 41: Angular building formation at Site B13.



Figure 42: Potential midden at Site B14.

The archaeological study conducted for the previous Samancor Buffels East and West projects did not record significant historical sites (Pelser & Van Vollenhoven 2008).

5.4 Contemporary Remains

No contemporary remains were observed.

The archaeological study conducted for the previous mining development recorded an angular stone-walled enclosure that potentially related to contemporary quarrying (Pelser & Van Vollenhoven 2008). The site was not considered to be significant.

5.5 Graves

One potential grave and one cemetery were observed during the site inspection (**Table 5**). Potential grave B01 is located in the north-eastern section of the study area and approximately 3.8 m north of the proposed fence. The site consists of an elongated stone cairn within dense vegetation (**Figure 43**). Although the stone cairn resembles an informal grave, the possibility also exists that the feature relates to past mining activities. Additionally, the general area surrounding this site appears to have been disturbed by past agricultural activities.

Cemetery B10 is located within the sensitive LIA area and approximately 230 m south of the nearest proposed development footprint (**Figures 44 – 50**). The cemetery is not fenced-off, is in a dilapidated state and consists of a combination of formal and informal surface dressings. Although in a dilapidated state, the graves appear to be oriented in an east-west direction. Grave goods in the form of glass and plastic bottles, as well as tin cups were noted. The earliest observed burial date is 1939 and the most recent 1956. Due to the dilapidated state of the cemetery and the cut crass covering some of the graves, the number of graves could not be determined, but is

estimated to be more than 100. Also, the graves have most likely not been visited in recent years since the mine is fenced-off and no-one at the mine was aware of the cemetery. It should be noted that the cemetery is located outside of the demarcated development footprint and no impact by the proposed project is foreseen.

Table 5: Graves & cemeteries

Name	Type	Source	Status	Estimates extent	Parcel	Number of graves
B01	Potential Grave	Field	Intact	± 2 m ²	118	Rough estimate: 100 +
B10	Cemetery	Field	Intact	± 0.3 ha	120	1



Figure 43: Potential grave at Site B01.



Figure 44: Slashed section at Cemetery B10.



Figure 45: Obscured grave at Cemetery B10.



Figure 46: Informal graves at Cemetery B10.



Figure 47: Dense vegetation at Cemetery B10.

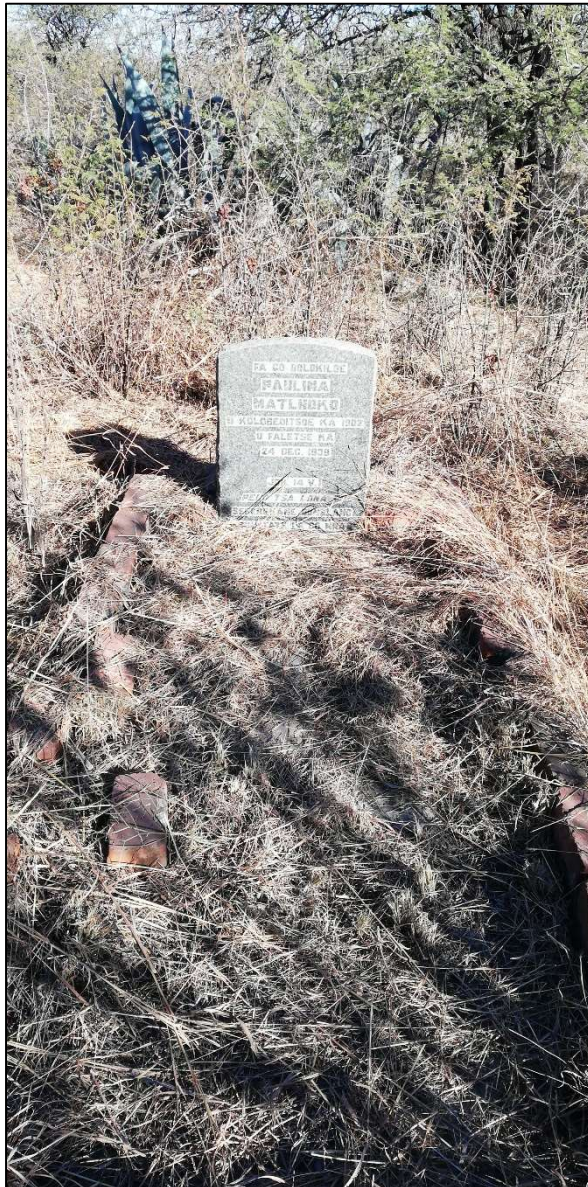


Figure 48: Grave dating to 1939 at Cemetery B10.



Figure 49: Grave dating to 1956 at Cemetery B10.



Figure 50: Grave goods at Cemetery B10.

The archaeological study conducted for the previous mining development (Pelser & Van Vollenhoven 2008) did not mention the presence of graves or burial sites.

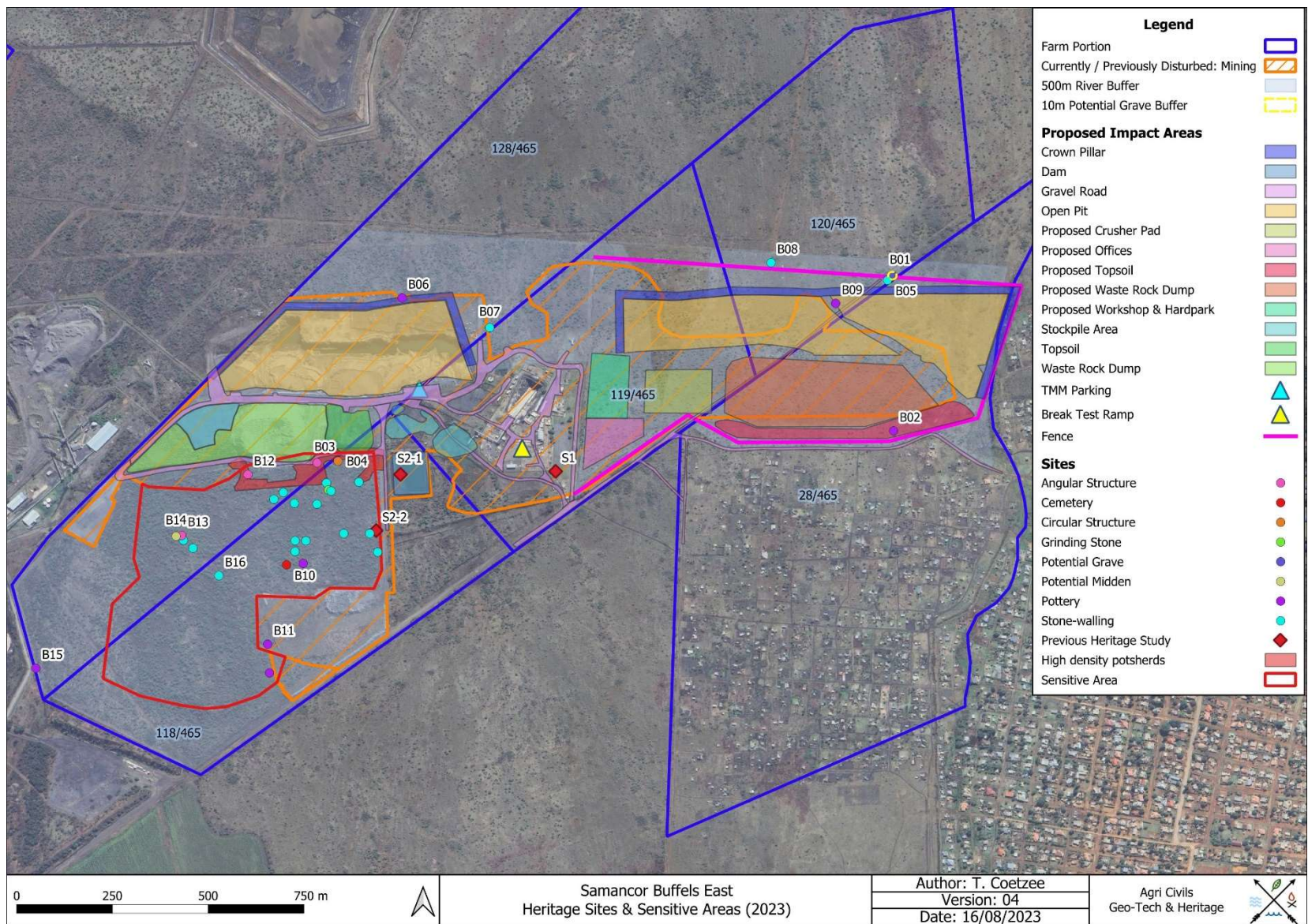


Figure 51: Heritage Sites indicated on a 2023 satellite image.

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 6: Prescribed 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 7: Individual Site Ratings

Site / Survey Point Name	Type	Rating	Field Rating/Grade	Significance	Recommendation
2527DA-B01	Potential Grave	Local	Grade 3 A	High	Mitigation not advised
2527DA-B02	Pottery	General Protection B	4 B	Medium	Record site
2527DA-B03	Angular Structure	General Protection B	4 B	Medium	Record site
2527DA-B04	Circular Structure	General Protection B	4 B	Medium	Record site
2527DA-B05	Stone-walling	General Protection B	4 B	Medium	Record site
2527DA-B06	Pottery	General Protection B	4 B	Medium	Record site
2527DA-B07	Stone-walling	General Protection B	4 B	Medium	Record site
2527DA-B08	Stone-walling	General Protection B	4 B	Medium	Record site
2527DA-B09	Pottery	General Protection B	4 B	Medium	Record site
2527DA-B10	Cemetery	Local	Grade 3 A	High	Mitigation not advised
2527DA-B11	Pottery	General Protection B	4 B	Medium	Record site
2527DA-B12	Angular Structure	General Protection B	4 B	Medium	Record site
2527DA-B13	Angular Structure	Local	Grade 3 A	High	Mitigation not advised
2527DA-B14	Potential Midden	Local	Grade 3 A	High	Mitigation not advised
2527DA-B15	Pottery	General Protection B	4 B	Medium	Record site
2527DA-B16	Stone-walling	Local	Grade 3 B	High	Part of site should be retained
S1	Stone-walling	General Protection C	4 C	Low	No recording necessary
S2-1	Stone-walling	General Protection C	4 C	Low	No recording necessary
S2-2	Stone-walling	Local	Grade 3 B	High	Part of site should be retained

*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 mining development on Portions 28, 35, 118, 119, 120, 128 and 139 of the Farm Buffelsfontein 465 JQ

The greater study area is considered to be significant from a heritage perspective since the area is associated with Stone Age sites, LIA settlements, historic sites and cemeteries, while the demarcated study area is partially located within 500 m of rivers/streams, a zone that is generally associated with a higher heritage site probability.

The demarcated sensitive area (Site B16), as well as Sites B03, B04, B10, B12, B13, B14, and S2-2 which fall within the sensitive area boundary, are associated with a high concentration of stone-walled settlements, material culture, demolished buildings, features dating to the historic period, and a large cemetery. The sites associated with the demarcated sensitive area are considered to be significant and sensitive from a heritage perspective and are protected by the NHRA (Act No. 25 of 1999). The stone-walled sites form part of a larger LIA complex and can be linked via oral traditions to ancestors of the Tswana who settled in the area from the 17th Century onwards. These LIA stone-walled sites are increasingly threatened by development, agricultural activities and urban sprawl and should be conserved. No development, however, is planned for the demarcated sensitive area.

Sites B02, B05 – B09, B11 and B15 consist of a combination of undiagnostic LIA pottery fragments and sections of stone-walling. These sites, however, generally occur in isolation, are associated with previously cultivated land and areas affected by previous mining activities. Therefore, the associated sites occur in a secondary context and are not considered to be significant from a heritage perspective.

Site B01, a potential grave, is considered to be potentially sensitive from a heritage perspective and might be protected by 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, 1999 (Act No. 25 of 1999). Since the construction of a fence is proposed 3.8 m to the south of Site B01, the potential grave might be impacted.

Sites S1 and S2-1 consisted of stone-walling. These sites, however, have subsequently been demolished by mining activities and are therefore not considered to be significant or sensitive from a heritage perspective.

7.2 Recommendations

The following recommendations are made in terms with the National Heritage Resources Act (Act No. 25 of 1999) in order to avoid the destruction of heritage remains associated with the area demarcated for development:

- The demarcated sensitive area (**Figure 51**), delineated from a combination of field observations and georeferenced historical aerial imagery, is associated with a dense concentration of stone-walled enclosures, potsherds, and grinding stones, as well as a cemetery. This area was identified during the previous heritage study and falls outside of the proposed impact area. Therefore, no impact is foreseen.
- The observed heritage sites falling outside of the sensitive area (B02, B05, B06, B07, B08, B09, B11, B15) appear in a disturbed context and are not considered to be significant. The recording done during the Phase 1 AIA is considered to be sufficient and no further action is required.
- Potential grave Site B01 might be impacted by the construction of the proposed fence. Since Site B01 could be sensitive from a heritage perspective, a fenced-off conservation buffer of 10 m is recommended for the effective in-situ preservation of the grave. The proposed fence infrastructure which should be at least 1.8 m high must include a gate to allow access by the family of the deceased individual. A distance of at least 2 m must be maintained between the grave and fence. Should relocation of the grave be considered in the future, a full 60 days consultation process as stipulated in the NHRA Regulations of 2000 must be implemented to identify the family of the deceased individual who must then be consulted to give consent for the relocation. Alternatively, the site may be inspected using Ground Penetrating Radar (GPR) operated by a suitably qualified heritage practitioner in order to determine the potential presence of human remains.
- Sites S1 and S2-1 consisted of stone-walling. These sites have been demolished by mining related activities and are not considered to be sensitive or significant from a heritage perspective. No further action is required.

General Recommendations

- The above recommendations are based on the specific project activities and extents as indicated by 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.
- Should uncertainty regarding the presence of heritage remains exist, or if heritage resources are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted as soon as possible.

- As archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the construction, development and operational phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development, construction and operational phases, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, No. 25 of 1999 section 36 (6)).

8. Conclusion

The proposed Buffelsfontein East Mining Project will consist of opencast mining activities and surface infrastructure impacting approximately 57.84 ha. A fence of 2.4 km is proposed as well. The project area is associated with a combination of LIA sites, Historical remains and a cemetery, some which are protected by legislation. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Buffelsfontein East Mining 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

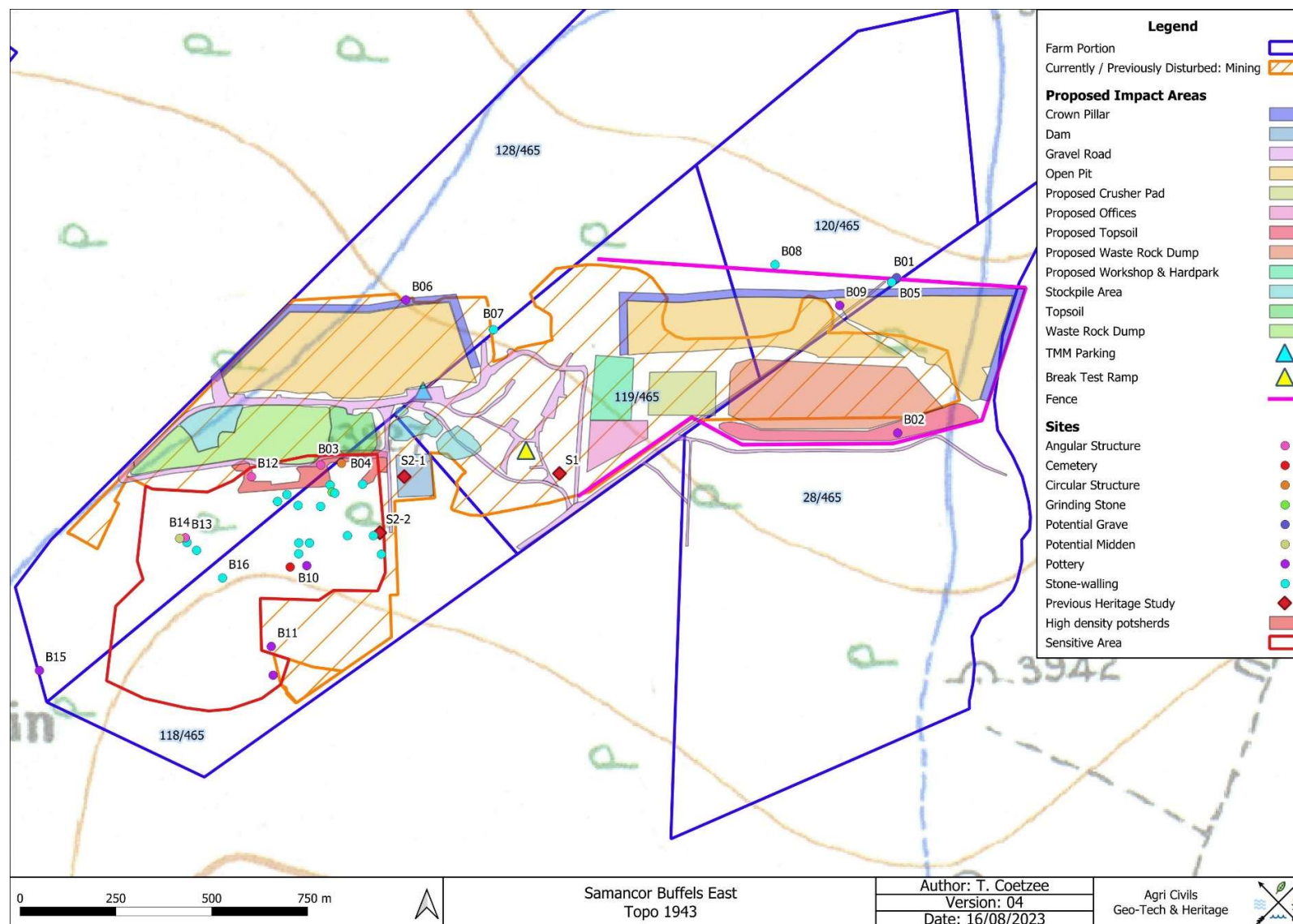


Figure 52: Study area superimposed on a 1943 1: 50 000 2527 DA topographical map.

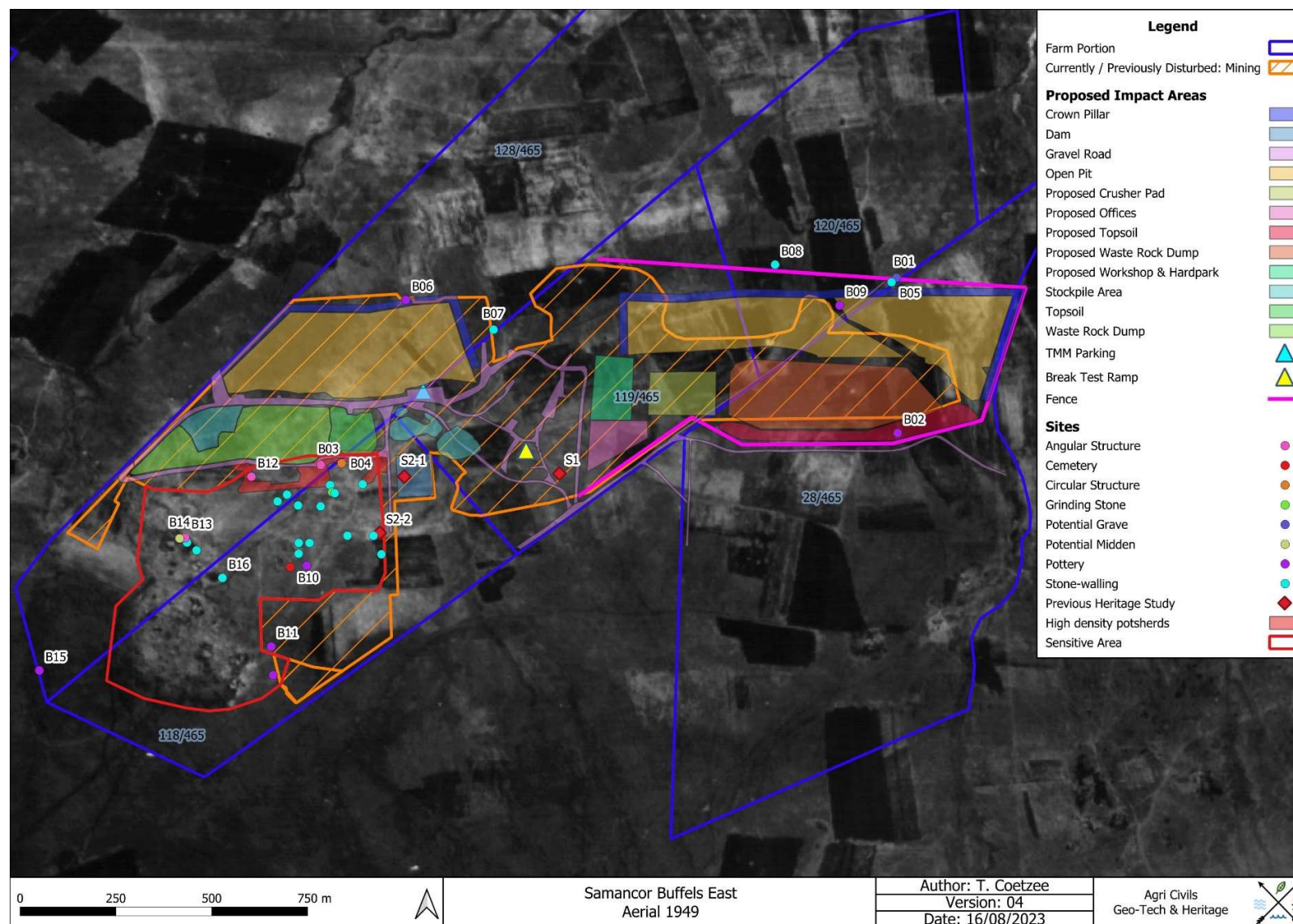


Figure 53: Study area superimposed on a 1949 aerial photograph.

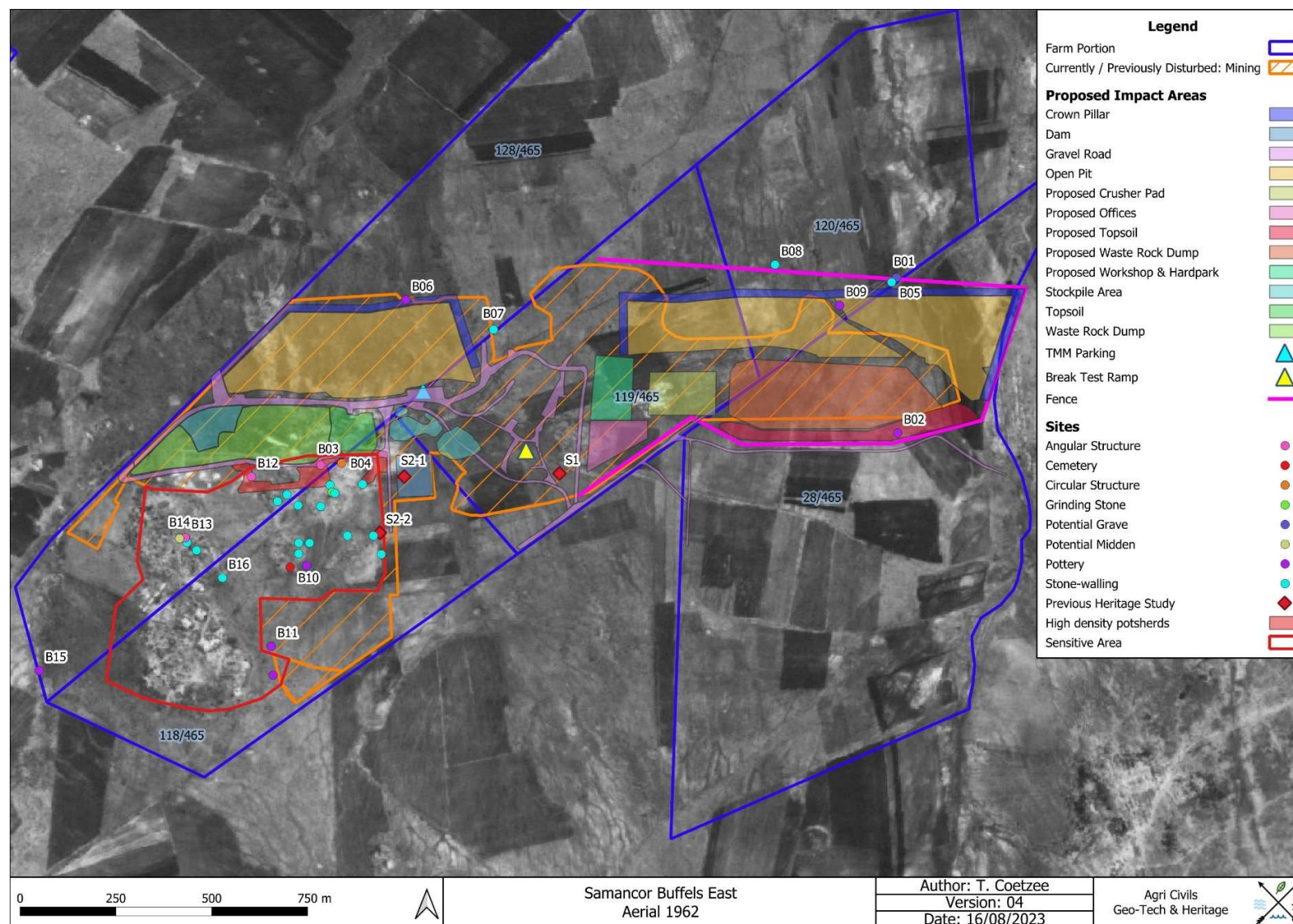


Figure 54: Study area superimposed on a 1962 aerial photograph.

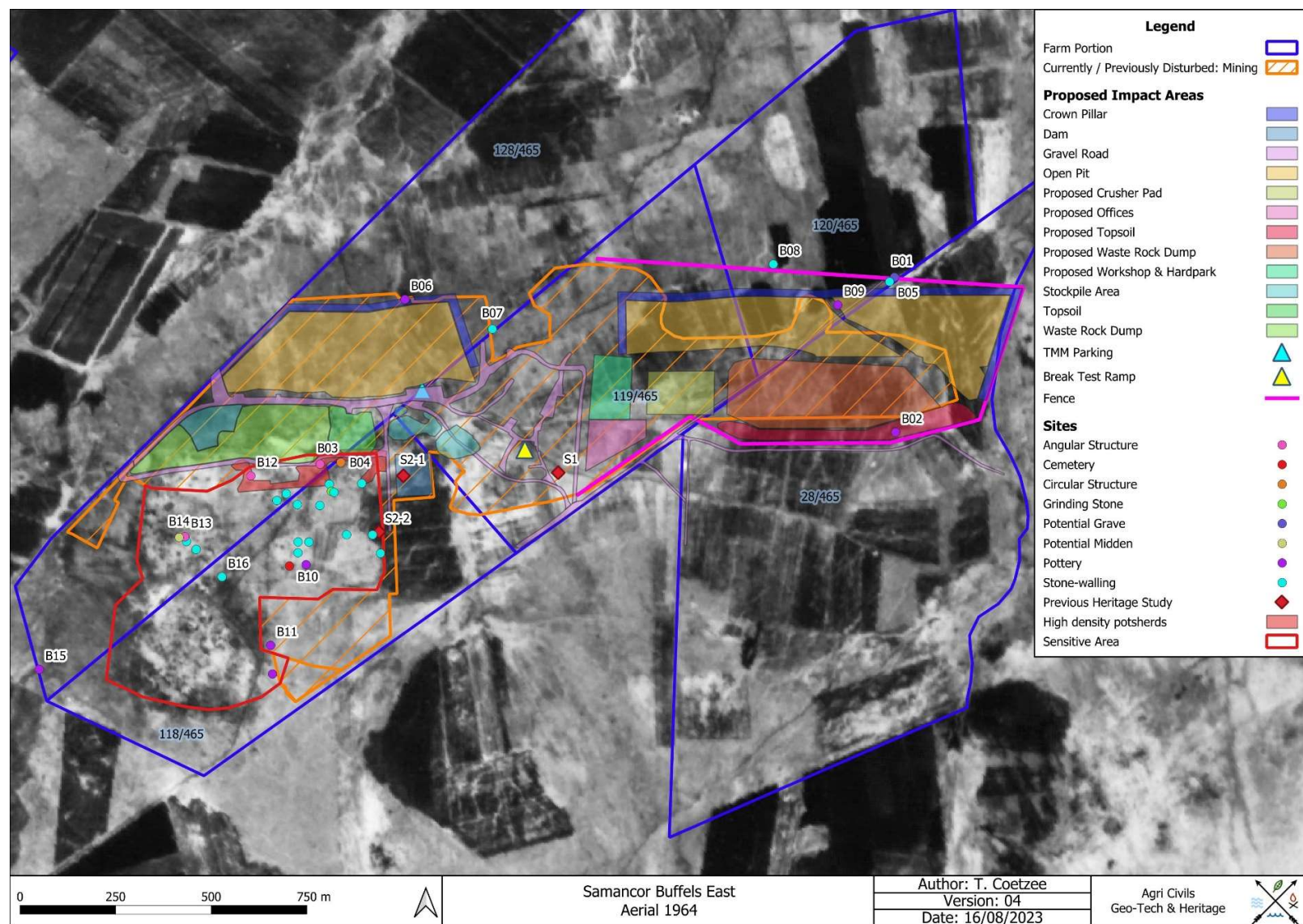


Figure 55: Study area superimposed on a 1964 aerial photograph.

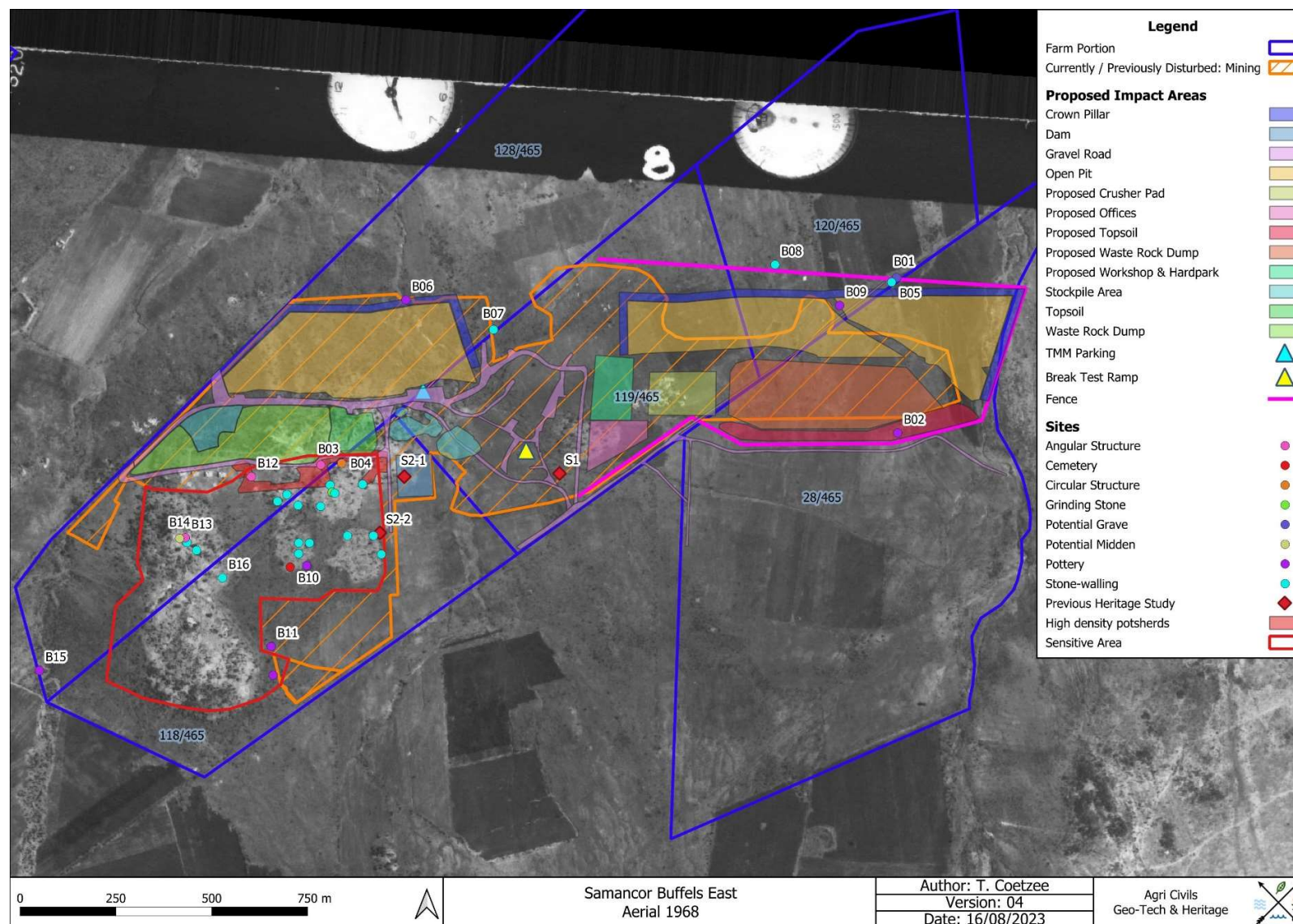


Figure 56: Study area superimposed on a 1968 aerial photograph.

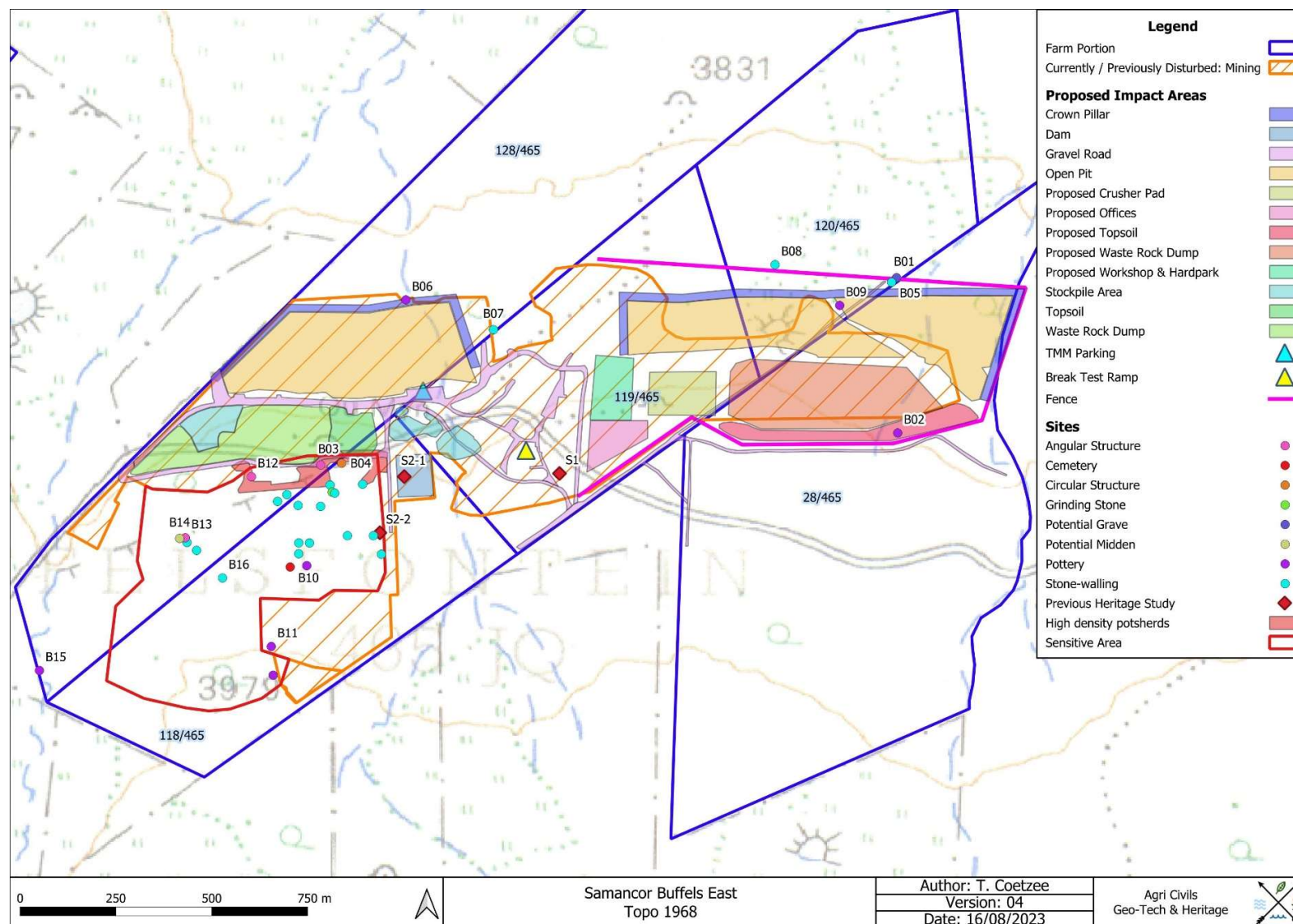


Figure 57: Study area superimposed on a 1968 1: 50 000 2527 DA topographical map.

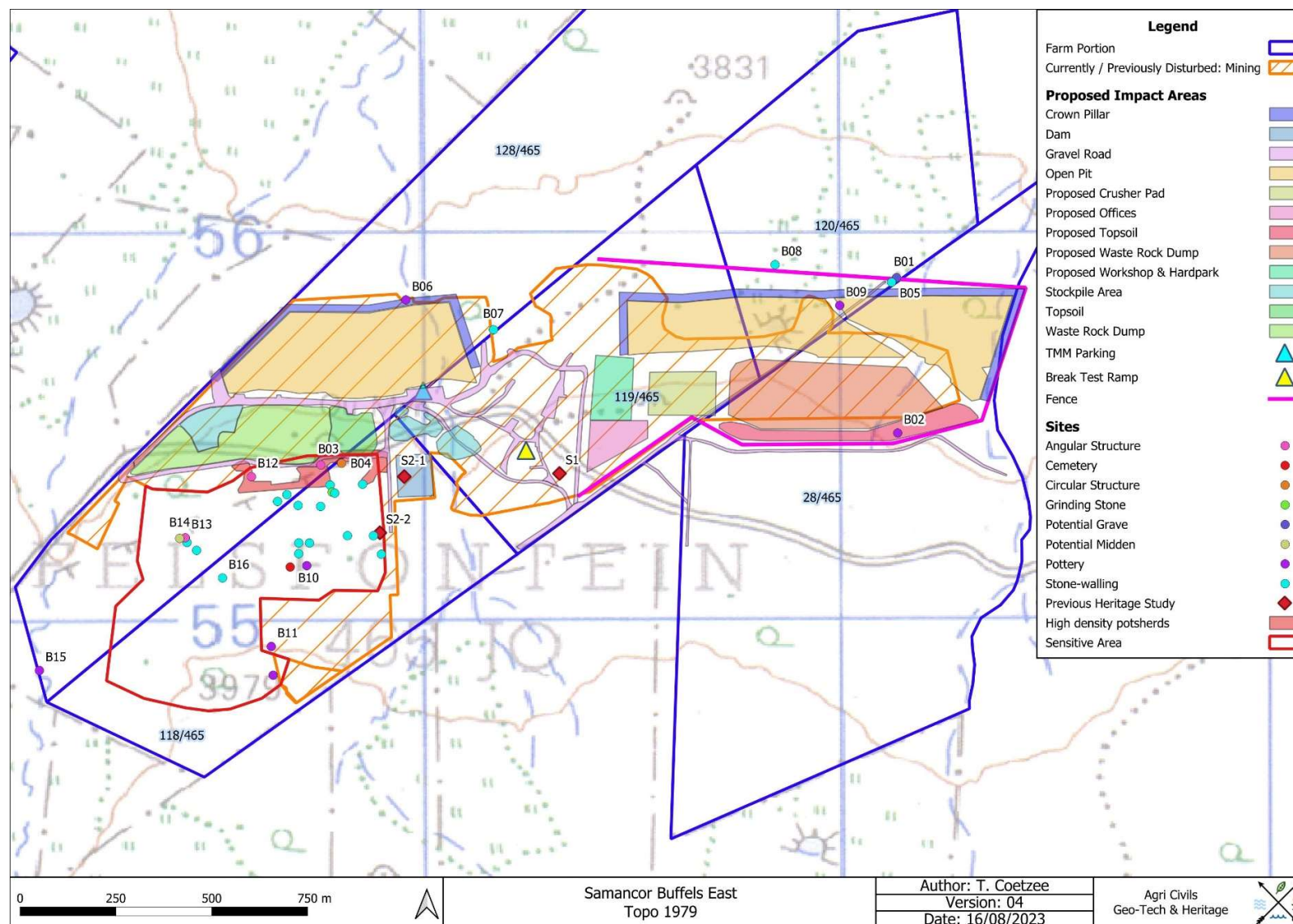


Figure 58: Study area superimposed on a 1979 1: 50 000 2527 DA topographical map.

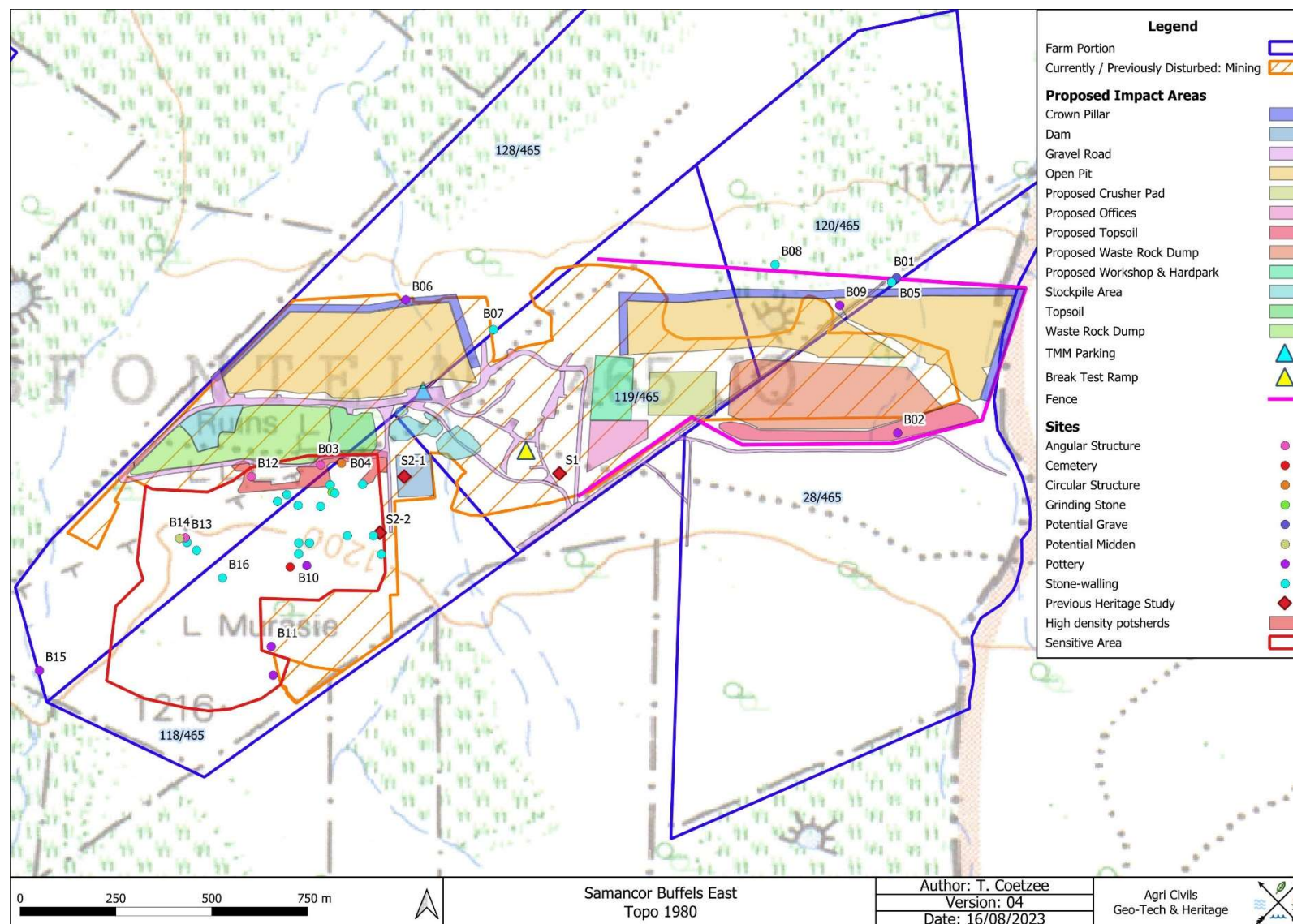


Figure 59: Study area superimposed on a 1980 1: 50 000 2527 DA topographical map.

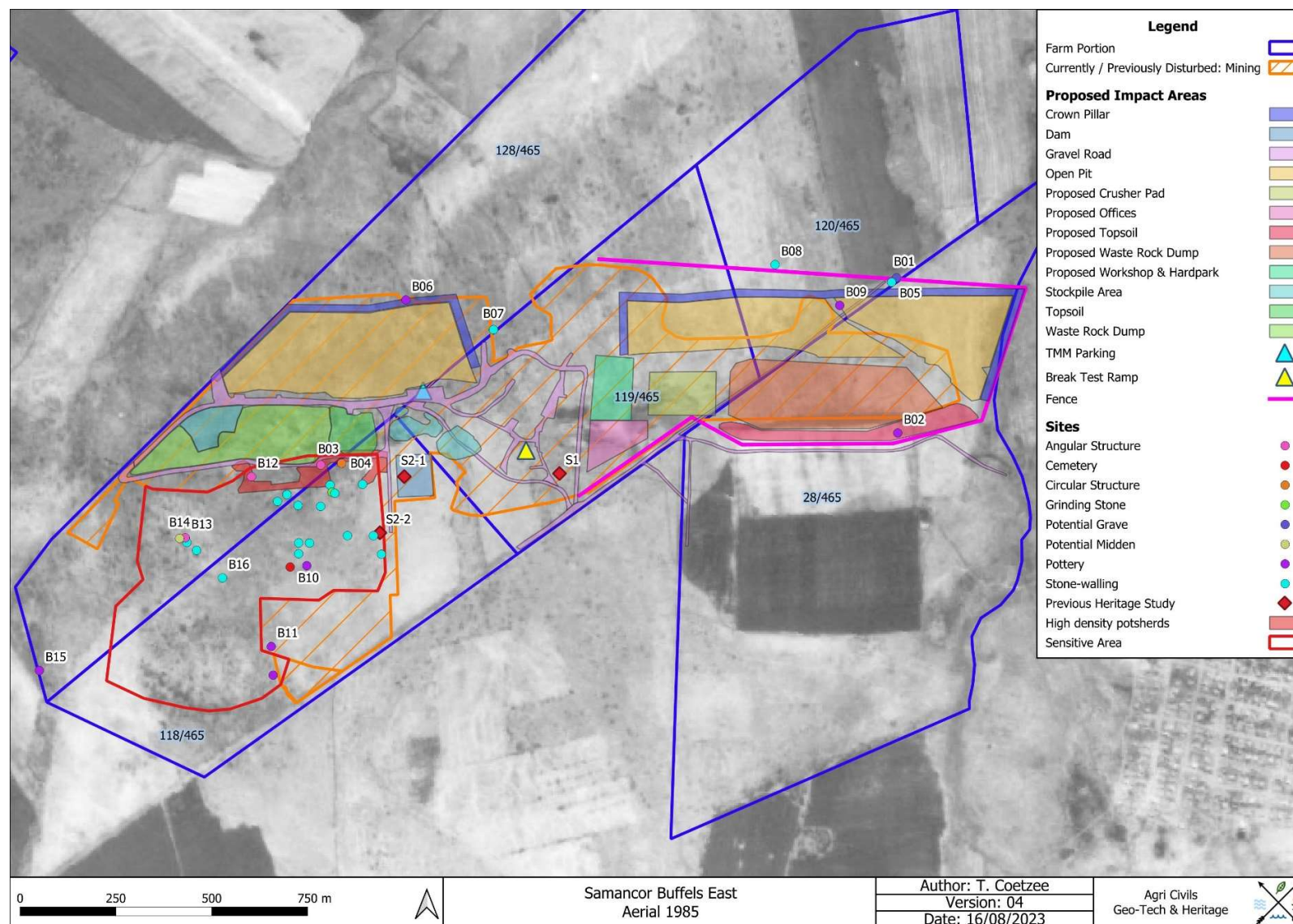


Figure 60: Study area superimposed on a 1985 aerial photograph.

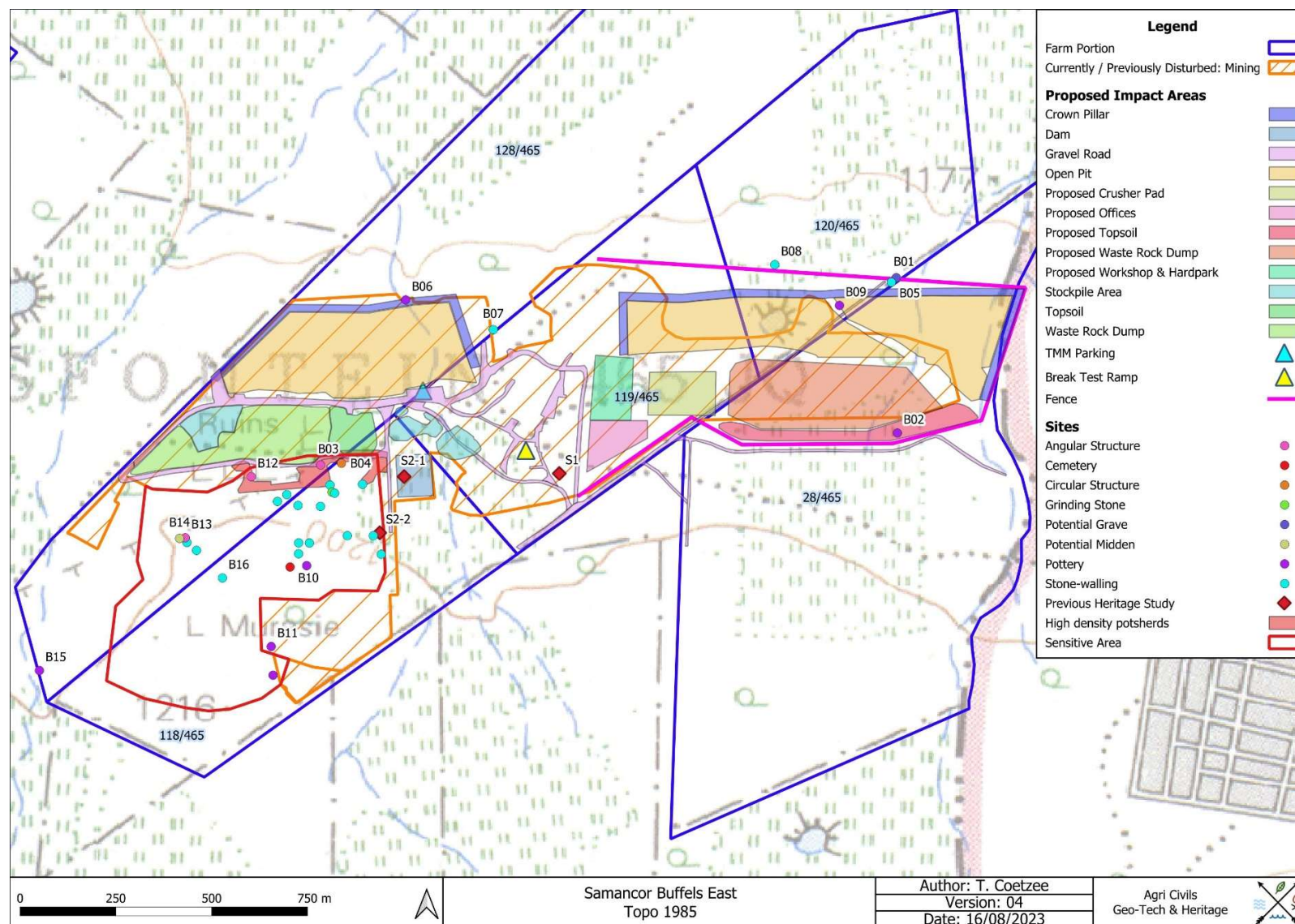


Figure 61: Study area superimposed on a 1985 1: 50 000 2527 DA topographical map.

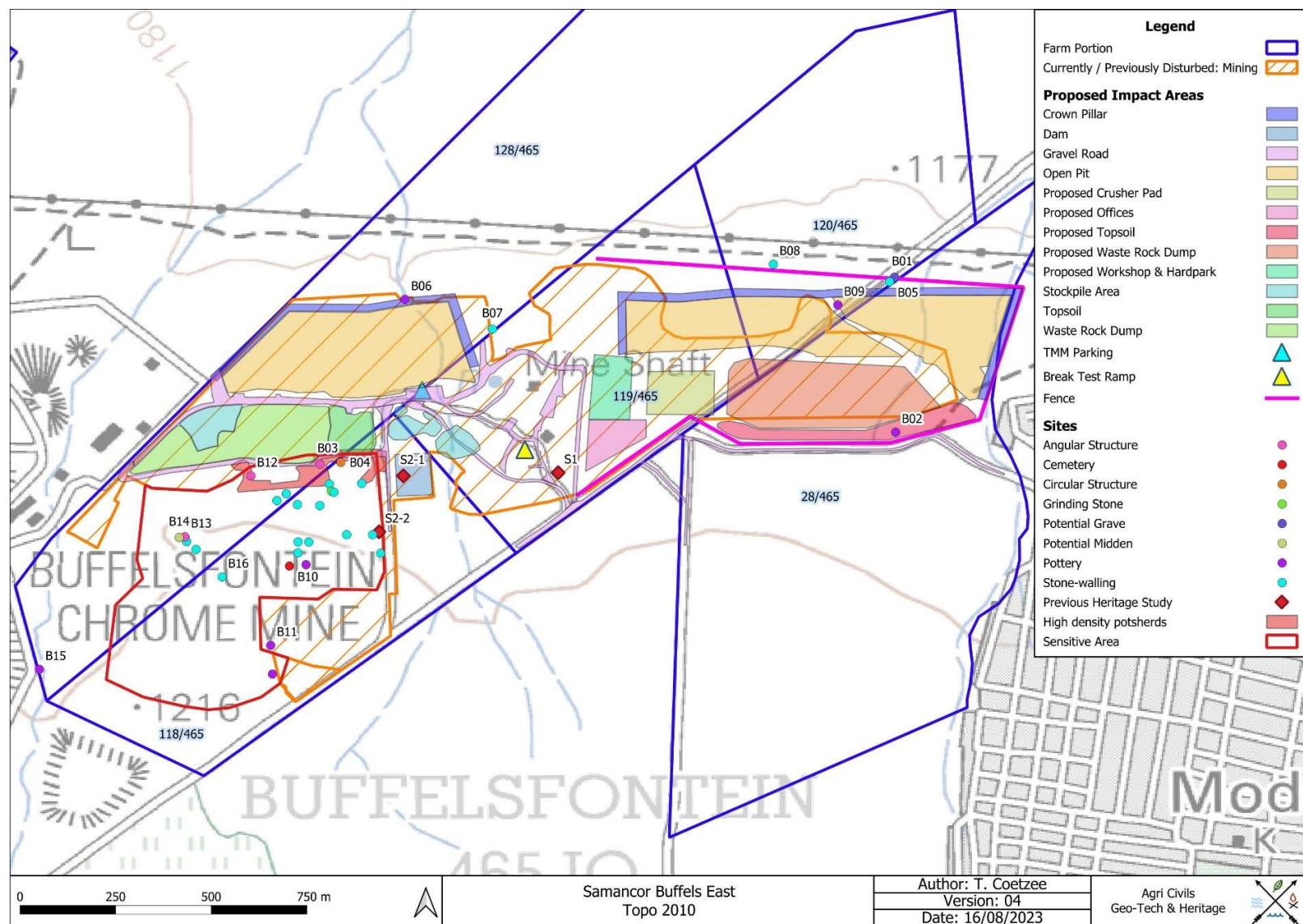


Figure 62: Study area superimposed on a 2010 1: 50 000 2527 DA topographical map.

Appendix B: 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 activity.
2	Site	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 commencement 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 ce

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 implantation of mitigation management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implantation 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 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 t 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 plan 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 the scores a presented below:		
<p style="text-align: center;"><i>Equation 1:</i></p> <p style="text-align: center;"><i>Significance = Irreplaceability (Reversibility + Intensity + Duration + Extent) X Probability</i></p>		

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		
Degree to which the impact can be mitigated: <i>The effect of mitigation measures on the impact and its degree of effectiveness:</i> <i>Equation 2:</i> $\text{Significance Rating} = \text{Significance} \times \text{Mitigation Efficiency}$		
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 C: Monitoring – Heritage

Site	Impact	Applicable Phase	Action	Frequency	Responsible person
Sensitive area	Potential damage to surface / subsurface remains	Construction/Development	Fencing of northern and eastern borders, Site Maintenance Plan	Once	ECO/Mine/Archaeologist
Potential Grave	Potential damage to grave	Planning & Construction	Avoid potential grave, Erect 10 m conservation buffer. Alternatively: GPR / Relocate	Once – planning	ECO/Mine
All surface impacts	Potential damage to subsurface culturally significant material	Construction / Development / Operational	Monitor subsurface material	Duration of construction	ECO