Agri Civils
Geo-Tech & Heritage

# PHASE 1 HERITAGE IMPACT ASSESSMENT

## for the Proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR, KwaMhlanga, Mpumalanga Province

**For:**
BECS Environmental (Pty) Ltd

**Project Ref:**
Roodepoort Clay Quarry

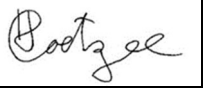
**Date:**
28/07/2023

**Phase 1 Heritage Impact Assessment for the Proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR, KwaMhlanga, Mpumalanga Province**

| | |
|---|---|
| Project Ref: | Roodepoort Clay Quarry |
| Report No: | BE-2807231 |
| Report Version: | 1 |

I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Roodepoort Clay Quarry Pit Extension Project 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.

| Author | Qualification | Email | Date | Signature |
|---|---|---|---|---|
| Tobias Coetzee | MA (Archaeology – UP) | tcoetzee.heritage@gmail.com | 28/07/2023 |  |

# Executive Summary

Agri Civils Geo-Tech & Heritage was appointed by BECS Environmental (Pty) Ltd to undertake a Phase 1 Heritage Impact Assessment for the proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR near KwaMhlanga in the Mpumalanga Province. The aim of the study is to determine the scope of archaeological resources that could be impacted by the proposed extension of the clay quarry.

Two areas were identified for the proposed expansion project: A northern pit and a southern pit. The majority of both demarcated areas used to be cultivated and have been impacted by mining related activities. Also, the demarcated areas are not located within 500 m of a river or stream and no potential heritage sites were observed on historical aerial images, topographical maps, or during the pedestrian survey. The demarcated pit areas are therefore considered to be disturbed and are not sensitive from a heritage perspective.

Subject to adherence to the recommendations and approval by the South African Heritage Resources Agency, the proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR as per the demarcated boundaries may continue. Should skeletal remains be exposed during the project, all activities must be suspended, and the relevant heritage resources authority must be contacted (See National Heritage and Resources Act, 1999 (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.

# List of Abbreviations

**AIA** – Archaeological Impact Assessment

**CRM** – Cultural Resource Management

**DMR** – Department of Mineral Resources and Energy

**EIA** – Environmental Impact Assessment

**ESA** – Early Stone Age

**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

**MSA** – Middle Stone Age

**NHRA** – National Heritage Resources Act

**SAHRA** – South African Heritage Resources Agency

**SAHRIS** – South African Heritage Resources Information System

**ya** – Years ago

# 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 | P2 |
| (ii)the expertise of that specialist to compile a specialist report including a curriculum vitae; | 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 |
| (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; | 7 |
| (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; | P35 |
| (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, Appendix B |
| (l) any conditions for inclusion in the environmental authorisation; | 7.2, Appendix B |
| (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | 7.2, Appendix B |
| (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 B |
| (o)a description of any consultation process that was undertaken during the course of preparing the specialist report; | 3.1.3 |

| 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 | N/A |
| (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 |

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# 1. Project Background

## 1.1 Introduction

BECS Environmental (Pty) Ltd appointed Agri Civils Geotech & Heritage to undertake a Phase 1 Heritage Impact Assessment (HIA) for the proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR near KwaMhlanga in the Mpumalanga Province (**Figure 1 & Table 1**). The purpose of this study is to examine the demarcated extension areas in order to determine if any archaeological resources of heritage value will be impacted by the proposed mining development, as well as to archaeologically contextualise the general study area. The aim of this report is to provide the developer with information regarding the potential location and sensitivity of heritage resources within the demarcated footprints.

In the following report, the implications for the proposed Roodepoort Clay Quarry Pit Extension Project with regard to heritage resources are discussed: Two demarcated portions located on the Remaining Extent of the Farm Roodepoort 439 JR. 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 the course of the project.

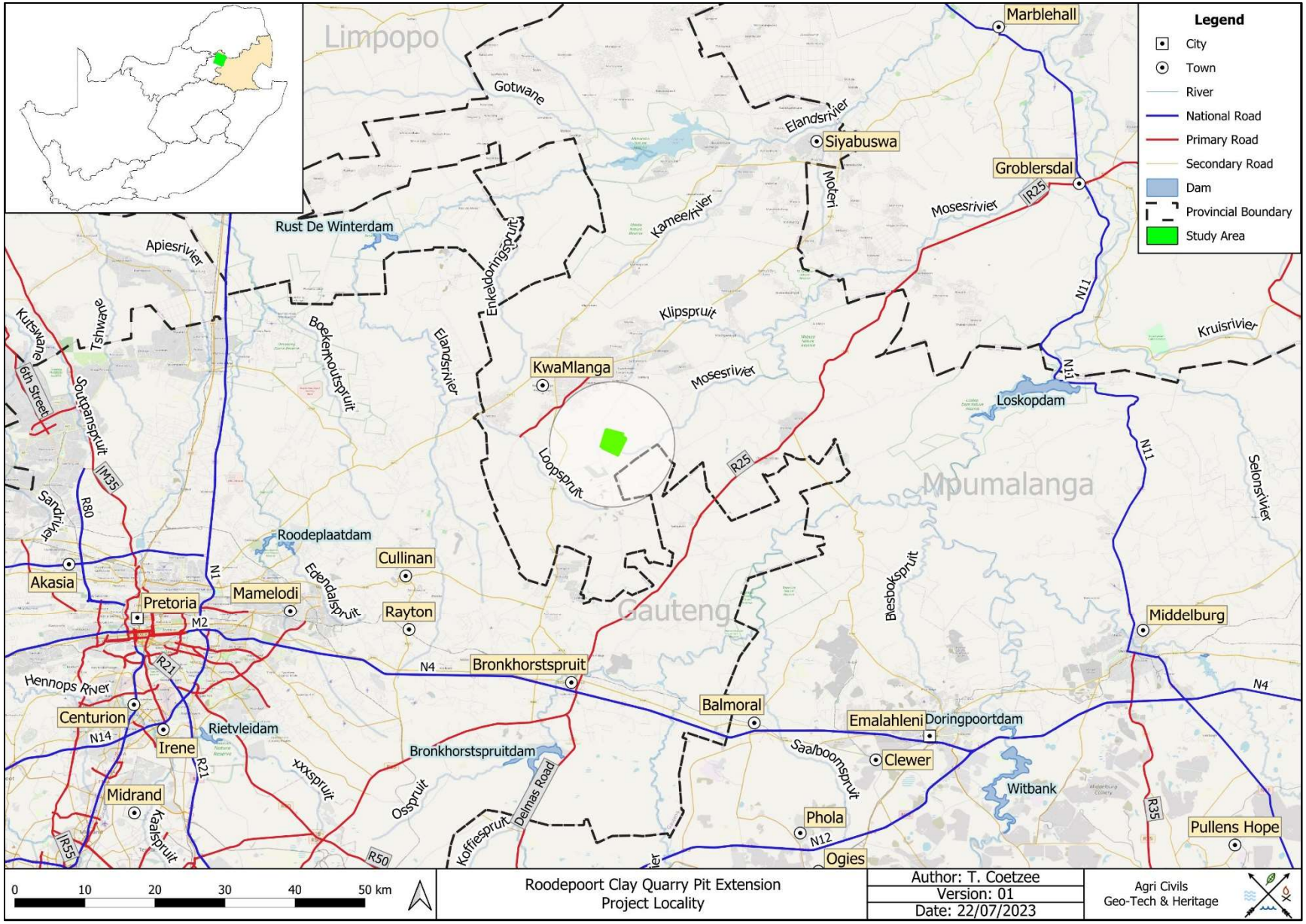


**Figure 1:** Regional and Provincial location of the study area.

## 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 if triggered.

Archaeological Impact Assessments (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 Environmental Impact Assessment (EIA) 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 Member of the Executive Council (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 demarcated Roodepoort Clay Quarry Pit Extension Project is situated to the southeast of KwaMhlanga. The proposed expansion areas are listed in **Table 1**.

**Table 1:** Proposed Pits & Land Parcels.

| Study Area | Farm Portion | Parent Farm | Lat | Lon | Map Reference (1:50 000) | Extent |
|---|---|---|---|---|---|---|
| Northern Pit | RE/439 | Roodepoort 439 JR | -25.497161 | 28.793551 | 2528 BD | 4 Ha |
| Southern Pit | RE/439 | Roodepoort 439 JR | -25.499985 | 28.795965 | 2528 BD & DB | 5.62 Ha |
| **Total** | | | | | | **9.62 Ha** |

The project area is located 12 km southeast of KwaMhlanga, while Cullinan is located roughly 32 km to the southwest, and Bronkhorstspruit 34 km to the south (**Figure 1**). The study area falls within the Nkangala District Municipality and the Thembisile Local Municipality in the Mpumalanga Province. In terms of vegetation, the study area falls within the Savanna Biome and the Central Bushveld Bioregion. On a local scale, the vegetation is classified as Central Sandy Bushveld (Mucina & Rutherford 2006).

According to Mucina & Rutherfords (2006), the conservation status for Central Sandy Bushveld is considered to be vulnerable. The conservation target for this vegetation unit is 19% and less than 3% is conserved, mostly in nature reserves. About 24% is transformed, including about 19% consisting of cultivated land and 4% of urban built-up areas. Central Sandy Bushveld is found in Limpopo, Mpumalanga, Gauteng and in the North West Provinces. This vegetation unit is associated with undulating terrain that occurs in a broad arc south of the Springbokvlakte from Pilanesberg in the west through Hammanskraal and Groblersdal to GaMasemola in the east. A narrow band along the north-western edge of the Springbokvlakte extends into some valleys and lower-altitude areas within the Waterberg. Rural communities densely populate much of the broad arc south of the Springbokvlakte. Erosion in these areas vary from very low to high.

The average elevation for Central Sandy Bushveld varies between 850 and 1450 MASL (metres above sea level). The average elevation of the project area is 1453 MASL and the gradient is generally even.

The study area falls within the summer rainfall region with an average annual rainfall of roughly 677 mm. The average annual temperature is 18.3 ºC, while the summer temperature averages 22.1 ºC and the winter temperature 12 ºC (Climate-data.org accessed 21/07/2023).

The study area falls within the B32G Quaternary Catchment that forms part of the Olifants Water Management Area (WMA). The closest perennial river to the project area is the Moses River that flows 970 m to the south. No non-perennial streams intersect the demarcated pit areas. The Roodeplaat Dam is located 45 km to the southwest and the Loskop Dam 50 km to the east.

When the surrounding environment is considered, the region is associated with crop cultivation and mining activity. Access to the study area is via a local road turning from a tertiary road to the west of the project area (**Figures 2 & 3**). On a local scale, the majority of the northern pit area and the southern pit's south-western corner have been disturbed by mining related activities. Although the eastern half of the southern pit area is currently characterised by open veldt, both proposed pit areas were cultivated in the past.

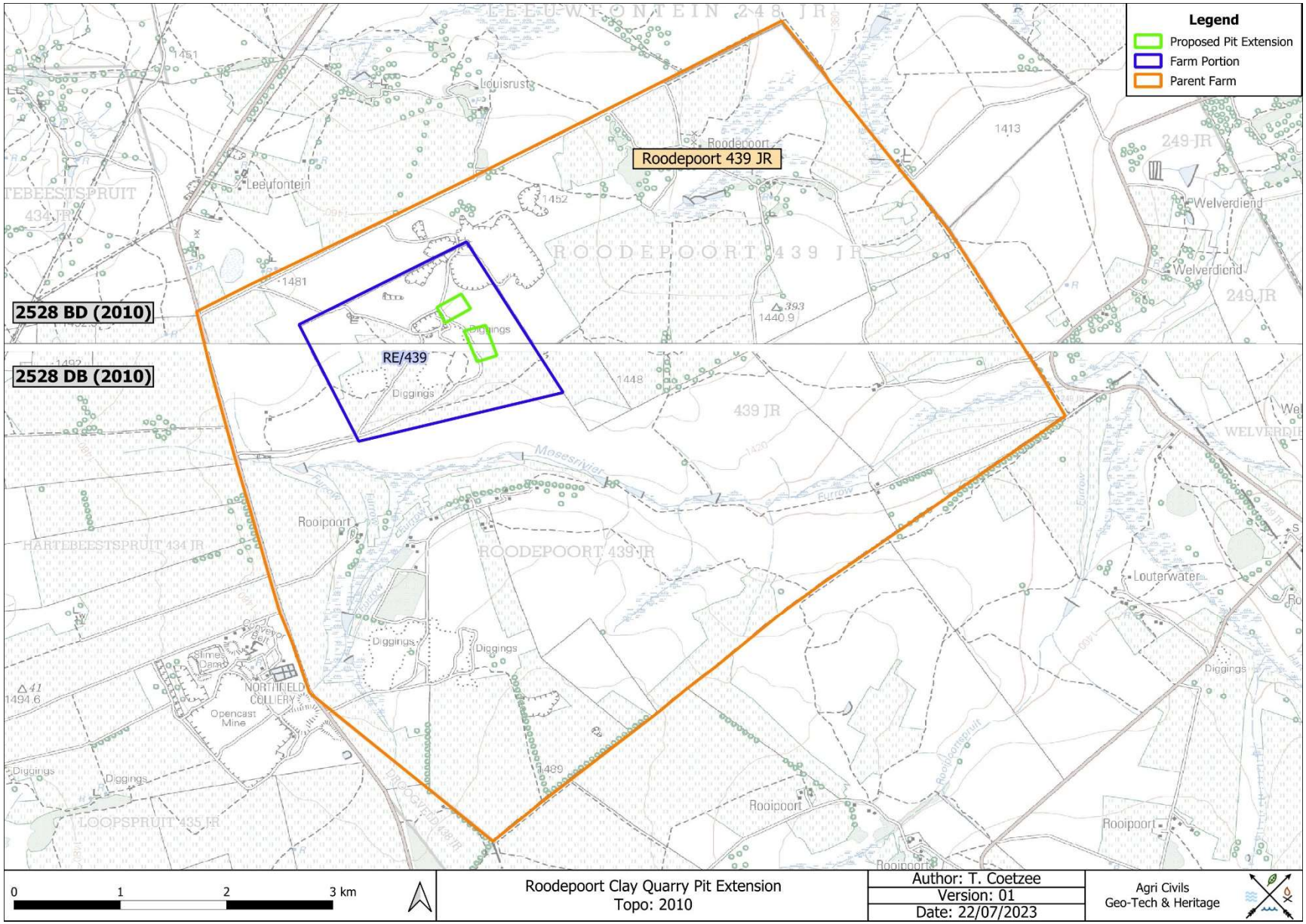


**Figure 2:** Segments of SA 1: 50 000 2528 BD & DB indicating the study area.


**Figure 3:** Study area portrayed on a 2023 satellite image.

## 2.2 Project Description

Two additional quarry areas bordering the existing Roodepoort Clay Quarry on the Remaining Extent of the Farm Roodepoort 439 JR are planned. As a result, an EIA will be done as part of a Mining Right. The northern proposed quarry measures 4 ha, while the southern proposed quarry measures 5.62 ha.

# 3. Methodology

Archaeological reconnaissance of the two demarcated pit areas were conducted during July 2023 through a systematic pedestrian survey (**Figure 4**). General site conditions were recorded via photographic record (**Figures 5 – 13**). Also, the project area was inspected on Google Earth, historical topographical maps, and historical aerial imagery in order to identify potential heritage remains (**Appendix A**). The historical topographical maps dating to 1967/1969, 1984, 1995, and 2010, as well as the historical aerial images dating to 1939, 1961, 1976, 1980, and 2003/2006, proved useful in terms of providing an indication of potential heritage sites and past land uses associated with the proposed pit areas. No potential sites were identified on historical topographical maps, aerial images, or on contemporary satellite imagery. Also, no heritage sites were identified during the pedestrian survey (**Figure 4**). The total area inspected was approximately 9.62 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. No rivers or streams, however, are located within 500 m of the demarcated pit areas. Additionally, the areas that have been disturbed by cultivation and contemporary/previous mining activities were plotted using topographical maps and historical aerial imagery, indicating areas that are considered to be less sensitive from a heritage perspective (**Figure 18**). Both areas, however, have completely been disturbed by a combination of mining related activities and cultivation.

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 within 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 Global Positioning System (GPS) during the site visit, as well as by plotting the boundaries from aerial imagery, satellite imagery and topographical maps.

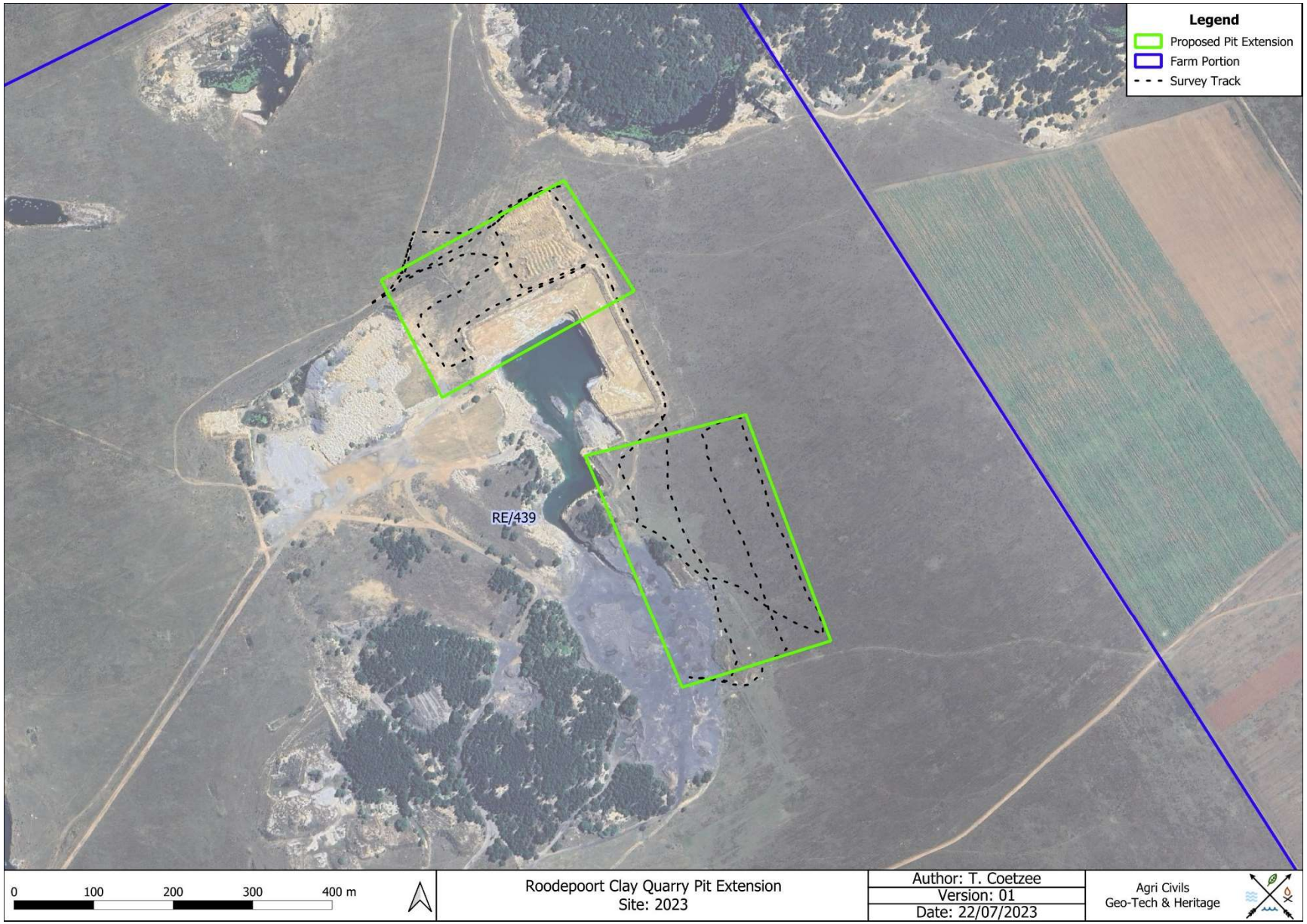


**Figure 4:** Study area with survey track portrayed on a 2023 satellite image.

**Figure 5:** Northern aspect of the proposed northern pit.

**Figure 6:** Eastern aspect of the proposed northern pit.

**Figure 7:** Southern aspect of the proposed northern pit.

**Figure 8:** Western aspect of the proposed northern pit.

**Figure 9:** Disturbed section at the proposed northern pit.

**Figure 10:** Northern aspect of the proposed southern pit.

**Figure 11:** Eastern aspect of the proposed southern pit.

**Figure 12:** Southern aspect and disturbed section of the proposed southern pit.

**Figure 13:** Western aspect of the proposed southern pit.

## 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, as well as general environmental conditions, were recorded by means of a Garmin Oregon 750 GPS and were photographed with a Samsung A71 mobile phone.

Additional sources consulted include an inspection of historical aerial images and historical topographical maps, previous heritage studies conducted in the general area, and the South African Heritage Resources Information System (SAHRIS) database.

### 3.1.1 Previous Heritage Studies

**Chicken breeding facility – Buffelsdrift 179 JR**

A Heritage Impact Assessment was conducted for a chicken breeding facility on the Farm Buffelsdrift 179 JR. The demarcated impact area was approximately 4000 m² and is located roughly 40 km northwest of the proposed Roodepoort Clay Quarry Pit Extension Project. Van Schalkwyk (2007) surveyed the study area and located two cemeteries. The presence of LIA sites in the vicinity of the Rust de Winter dam was also noted.

**132kV Power Line between Rust de Winter Substation and the Nokeng Substation**

A Phase 1 HIA was conducted by Pistorius (2011) for the construction of a 132 kV power line between the Rust de Winter substation and the Nokeng substation near Rust de Winter Dam. The power line is located approximately 28 km northwest of the proposed Roodepoort Clay Quarry Pit Extension Project and appears to intersect Portion 3 and the Remaining Extent of the Farm Naauwpoort 208 JR. The study recorded two cemeteries and three houses dating to the historic period. A strong possibility for Stone Age and Iron Age remains were noted as well.

**Nokeng Fluorspar Mine**

Kruger (2016) conducted an AIA for the Nokeng Fluorspar Mine on Portions 4 and 11 and the Remaining Extent of Portion 2 of the Farm Kromdraai 209 JR and Portion 1 of the Farm Naauwpoort 209 JR. Based on the property description, the Nokeng Fluorspar project area is located roughly 25 km northwest of the proposed Roodepoort Clay Quarry Pit Extension Project. The project entails surface infrastructure and development on approximately 140 ha. The study, that serves as an update to the initial heritage study conducted by Kusel (2009), lists the presence of cemeteries, building ruins, an MSA stone tool scatter and an Iron Age stone-walled site with terracing.

**KwaMhlanga 132/22kV 2x40MVA Substation and 11kV to 22kV Network Conversion**

Archaetnos cc conducted an AIA for the KwaMhlanga 132/22kV 2x40MVA Substation and 11kV to 22kV network conversion on the following Farms: KwaMhlanga 617 JR, Enkeldoorn 217 JR, Zustershoek 246 JR, Enkeldoring 651 JR, Graslaagte 232 JR and Gemsbokfontein 231 JR. The Archaetnos project is located approximately 3 km northwest of the proposed Roodepoort Clay Quarry Pit Extension Project. During the study, seven sites of cultural heritage significance were identified. These include three graveyards, two historic farmyards, historic stone houses, and a historic stone kraal. The three graveyards were deemed to be significant from heritage perspective, while the remaining sites were considered to be of low heritage significance (Van Vollenhoven 2020).

### 3.1.2 Historical topographical maps & aerial images

No potential heritage sites were noted on the historical aerial images and historical topographical maps.

**1939 Aerial Image**

The earliest aerial image of the project area dates to 1939 (**Appendix A: Figure 19**) and shows sections of both demarcated pit areas to be cultivated, while the remaining areas consisted of open veldt.

**1961 Aerial Image**

The 1961 aerial image (**Appendix A: Figure 20**) shows no visible activity on the demarcated study areas. It is, however, likely that both areas were cultivated at the time.

**1967/1969 Topographical Map**

The earliest topographical map of the project area dates to 1967 (northern section) and 1969 (southern section) (**Appendix A: Figure 21**). The map shows that both areas consisted of open land at the time, but some mining activity is noted to the southwest of the project area.

**1976 Aerial Image**

The aerial image dating to 1976 (**Appendix A: Figure 22**) shows mining activities directly to the southwest of the two demarcated pit areas, as well as to the northeast. A few roads are also shown intersecting both demarcated areas.

**1980 Aerial Image**

The same detail is observed on the 1980 aerial image as in the 1976 aerial image (**Appendix A: Figures 22 & 23**).

**1984 Topographical Map**

Except for the roads, the 1984 topographical map shows the same detail as observed on the 1980 aerial image (**Appendix A: Figures 23 & 24**).

**1995 Topographical Map**

The 1995 topographical map (**Appendix A: Figure 25**) indicates the eastern half of the northern pit area to be cultivated, while the majority of the southern pit area is shown to be cultivated as well. The extent of the mining activities appears to have remained the same compared to the 1984 topographical map (**Appendix A: Figure 24**).

**2003/2006 Aerial Image**

The 2003/2006 aerial image (**Appendix A: Figure 26**) shows that the mining activities expanded slightly to include the south-western section of the southern pit area.

**2010 Topographical Map**

The 2010 topographical map (**Appendix A: Figure 27**) shows a small section along the southern boundary of the southern pit area to be cultivated, while roads are shown along the western boundaries of both areas. The mining activities also appear to have expanded during this time.

### 3.1.3 Personal Communication

To the mine's knowledge, no graves, burial sites or any other potential heritage resources are located within the demarcated pit areas.

### 3.1.4 SAHRIS Database

The databases containing the declared and graded heritage sites were exported from SAHRIS on 30/05/2023 and were plotted on the site map in order to determine the presence of previously recorded sites within the project area. Accordingly, no graded heritage sites are located within the demarcated pit areas, while the nearest declared heritage sites are found near Mamelodi approximately 57 km to the southwest and near Clewer 57 km to the southeast.

## 3.2 Limitations

The northern proposed pit area is generally associated with a disturbed surface and short grass cover that promoted visibility and free movement. The majority of the southern proposed pit area is associated with relatively dense grass cover that limited visibility to some extent. However, due to the area being previously cultivated, the inspected area is considered to be disturbed.

# 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.

## 4.1 The Stone Age

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 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 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). These artefacts are often associated with rocky outcrops or water sources.

## 4.2 The Iron Age & Historical Period

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 (LIA) 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 general region of the study area 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).

Oral traditions of Nguni-speaking Ndebele groups indicate their sites in the area to the east of Pretoria, while heritage reports conducted on the stone-walled sites of this area suggest that Ndebele-speaking people inhabited this area between the late 1600s and mid-1800s (Antonites 2020).

According to Van Vuuren (2006), Ndebele oral traditions state that they first settled at Emhlangeni, translating to "At the reeds", near Randfontein in the Gauteng Province. Accordingly, they entered the Pretoria region during the early to mid- 1600s and settled at KwaMnyamana, which translates to "Place of the Black Hills". KwaMnyamana is located close to the Hippo Quarries crusher site on the farms De Onderstepoort (300JR) and Doornpoort (295JR). The first chief to settle at this site was called Musi. A split between his sons caused the

Ndebele to divide into several tribal entities. The descendants of the youngest son, Ndzundza, moved further to the east, while the descendants of the eldest son, Manala, stayed behind.

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.

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.

### 4.2.1 The 1st Anglo-Boer War - The Battle of Bronkhorstspruit

In 1874 Lord Carnarvon, the Colonial State Secretary, wished to unite British territory and the two Republics under the British flag. Since none of these states were in favour of uniting, Carnarvon reasoned that through uniting with the Transvaal, the others would follow. Due to poor relations, the only option left was annexation. In 1877 Shepstone was send from Natal to Pretoria with a police force of 25 with the goal to annex the Transvaal. On 12 April 1877, Shepstone raised the British flag and the Transvaal was annexed without firing a single shot. Several deputations were sent to England to regain independence, but both failed. Consequently S. P. J. Kruger, P. Joubert and M. W. Pretorius decided to gather the nation at Paardekraal to discuss the future of the Transvaal. During the meeting, which lasted from 12 to 16 December 1880, it was decided that Heidelberg would serve as the seat of the government. British forces were stationed in most of the towns, but were too weak to launch attacks on the Boer forces. British forces were therefore ordered from Lydenburg to support forces in Pretoria. Upon receiving this news, Frans Joubert was sent from Heidelberg to Pretoria with a force consisting of between 200 and 300 men to intercept and stop these reinforcements. According to the historian, Theal, the British forces under Col. Anstruther consisted of 257 men and 34 wagons. On 20 December 1880 they arrived at the place known today as Bronkhorstspruit. A brief exchange of words in which Joubert requested Anstruther to discontinue his mission resulted in a 10 to 20-minute battle over open field. After a significant number of casualties on the British side, Col. Anstruther, who was mortally wounded, requested that the white flag be raised. According to Theal, 66 on the British side were killed and 72 wounded. Ten of the wounded eventually succumbed to their wounds as well. On the Boers' side, one commando member was killed in action and another five wounded. Later, another succumbed to his wounds. The captives were transported to Heidelberg and from there to the Vaal River. From there they were allowed to go to the Free State. This was the first open battle of the First Boer War (Roodt 1949: 7-9).

The photo below (**Figure 14**) depicts the settlement of Paul Grobler on the farm Klipeiland, where the Battle of Bronkhorstspruit took place. Grobler bought the farm from Salomon Prinsloo in the 1850's and renamed it from Kalkoenkrans to Klipeiland. One of the wounded commando members was treated in this homestead. In the background the homesteads of Marthinus Johannes Grobler can be observed (Rex 1969: 14). The Battle of Bronkhorstspruit took place approximately 37 km south of the proposed Roodepoort Clay Quarry Pit Extension Project.

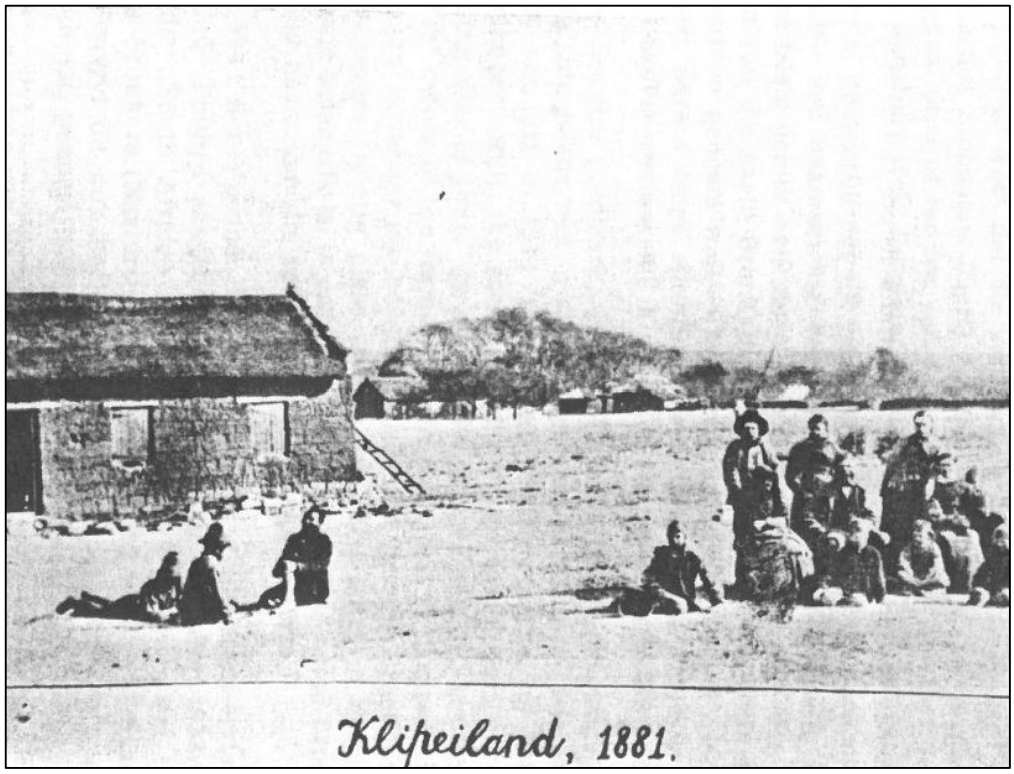


**Figure 14:** Grobler residence on Klipeiland (adapted from Rex 1969).

# 5. Archaeological and Historical Remains

## 5.1 Stone Age Remains

No Stone Age archaeological remains were located within the demarcated pit areas.

These artefacts are often associated with rocky outcrops or water sources. **Figures 15 – 17** below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

The HIA conducted by Pistorius (2011) noted a strong possibility for the presence of Stone Age remains, while the study conducted by Kruger (2016) recorded an MSA stone tool scatter.

According to Bergh (1999: 5), no major Stone Age archaeological sites are located in the direct vicinity of the study area. However, the LSA site, Fort Troje, is located just north of Cullinan and approximately 30 km southwest of the proposed Roodepoort Clay Quarry Pit Extension Project (Korsman et al. 1998: 95).

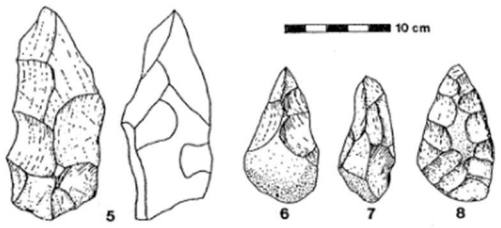


**Figure 15:** ESA artefacts (Volman 1984).

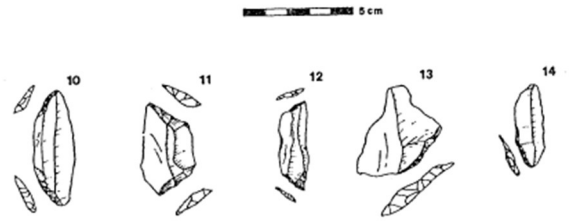


**Figure 16:** MSA artefacts (Volman 1984).


**Figure 17:** LSA scrapers (Klein 1984).

## 5.2 Iron Age Farmer Remains

No Iron Age Farmer remains were located within the demarcated pit areas.

Stone-walled sites are often detectable on satellite and aerial imagery. However, no such sites were noted on aerial and satellite imagery. Also, since the demarcated pit areas have been cultivated and disturbed by mining activities, it is unlikely that Iron Age artefacts will be located.

According to Bergh (1999), there are no Early or Late Iron Age concentrations in the immediate vicinity of the project area and few groups appear to have moved through the area during the *difaqane.*

Van Schalkwyk (2007) noted the presence of LIA sites in the vicinity of the Rust de Winter dam, while the heritage study conducted by Pistorius (2011) noted the potential presence of Iron Age remains. An Iron Age stone-walled site with terracing was also recorded by Kruger's (2016) study.

## 5.3 Historical Remains

No historical sites were located within the demarcated pit areas.

The heritage studies conducted by Pistorius (2011), Kruger (2016), and Van Vollenhoven (2020) recorded a combination of historic farmyards, buildings, ruins, stone houses, and a stone kraal.

## 5.4 Contemporary Remains

No contemporary sites were located within the demarcated pit areas.

The heritage studies conducted in the surrounding areas did not record significant contemporary remains (see Van Schalkwyk (2007), Pistorius (2011), Kruger (2016), Van Vollenhoven (2020)).

## 5.5 Graves/Burial Sites

No burial sites or graves were observed during the pedestrian survey.

The heritage studies conducted by Van Schalkwyk (2007), Pistorius (2011), Kruger (2016) and Van Vollenhoven (2020), recorded several graves and cemeteries in the general area.

# 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 NHRA (Act No. 25 of 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, 1999 (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

**Table 2:** 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 |

*No potential heritage sites were observed.

# 7. Statement of Significance & Recommendations

## 7.1 Statement of Significance

**The study area: The proposed Roodepoort Clay Quarry Pit Extension Project on the Remaining Extent of the Farm Roodepoort 439 JR**

The two areas demarcated for the proposed extension of the clay quarry have completely been disturbed by a combination of crop cultivation and mining related activities. Also, no potential heritage sites were noted on historical aerial imagery, historical topographical maps, or during the pedestrian survey. Additionally, the areas are not located within 500 m of a river / stream, a zone that is generally associated with a higher heritage site probability. The demarcated pit areas are therefore not considered to be sensitive from a heritage perspective (**Figure 18**).

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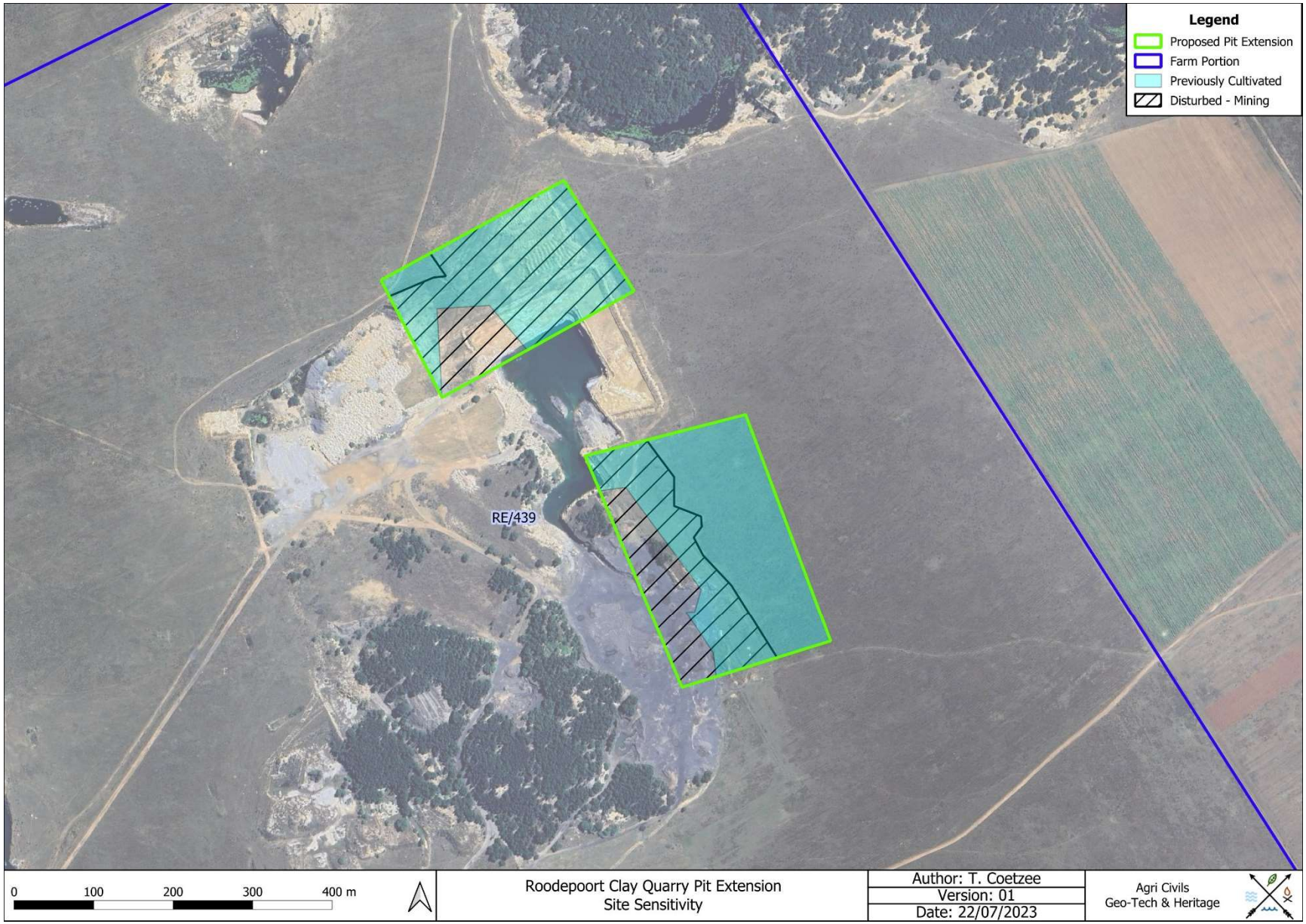


**Figure 18:** Study area and sensitive areas portrayed on a 2023 satellite image.

## 7.2 Recommendations

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

**The northern and southern pit areas**

- The demarcated pit areas used to be cultivated and are not located within close proximity of a river / stream. Additionally, significant sections have already been affected by mining related activities. The demarcated areas are therefore considered to be disturbed and are not sensitive from a heritage perspective.

**General**

- The above recommendation is based on the specific project extent and planned activities as indicated by the figures in this report. Should the proposed project / impact areas be altered to include additional areas, a qualified archaeologist must amend the HIA 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.

- Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the proposed development, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during the project, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).

- From a heritage point of view, the proposed Roodepoort Clay Quarry Pit Extension Project may continue, subject to the abovementioned conditions, recommendations, and approval by the South African Heritage Resources Agency.

# 8. Conclusion

The proposed Roodepoort Clay Quarry Pit Extension Project consists of two quarriers measuring 9.62 ha in total. Both assessed areas used to be cultivated, have largely been disturbed by mining related activities and no potential heritage resources were noted within the demarcated boundaries. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Roodepoort Clay Quarry Pit Extension Project as per the indicated boundaries 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 selvage 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 Imagery & Topographical Maps


**Figure 19:** Study area superimposed on a 1939 aerial image.

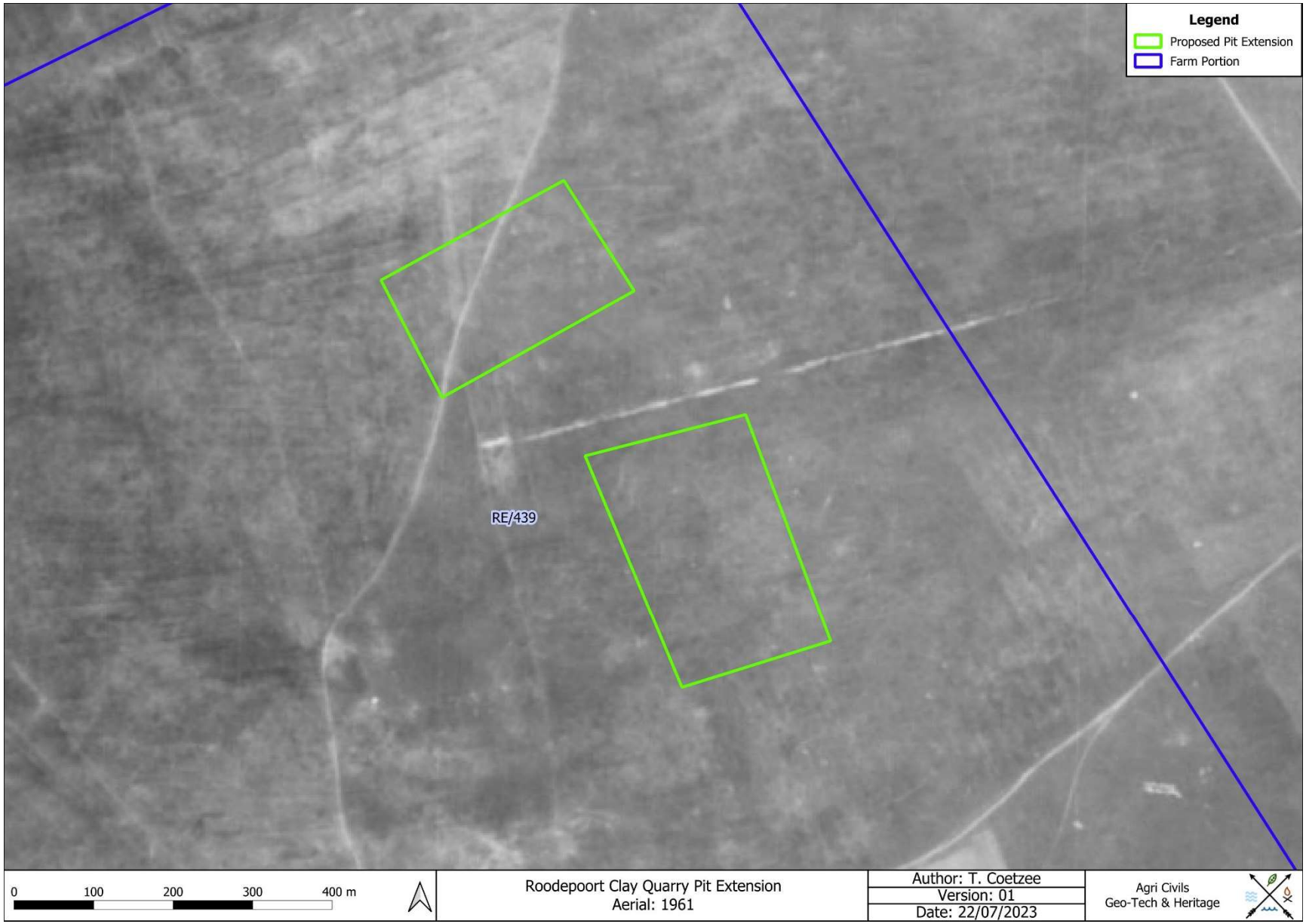


**Figure 20:** Study area superimposed on a 1961 aerial image.

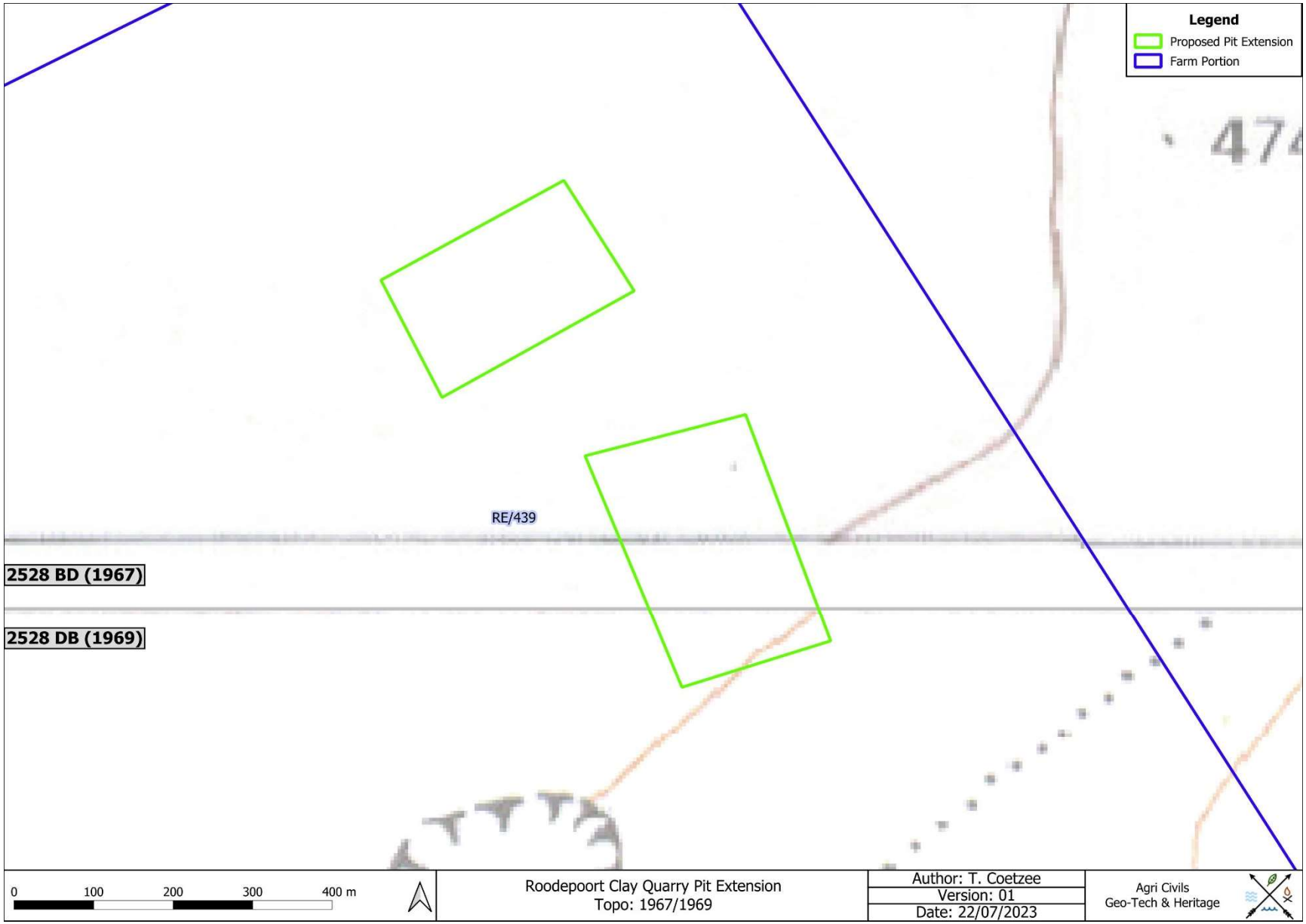


**Figure 21:** Study area superimposed on a 1967/1969 topographical map.

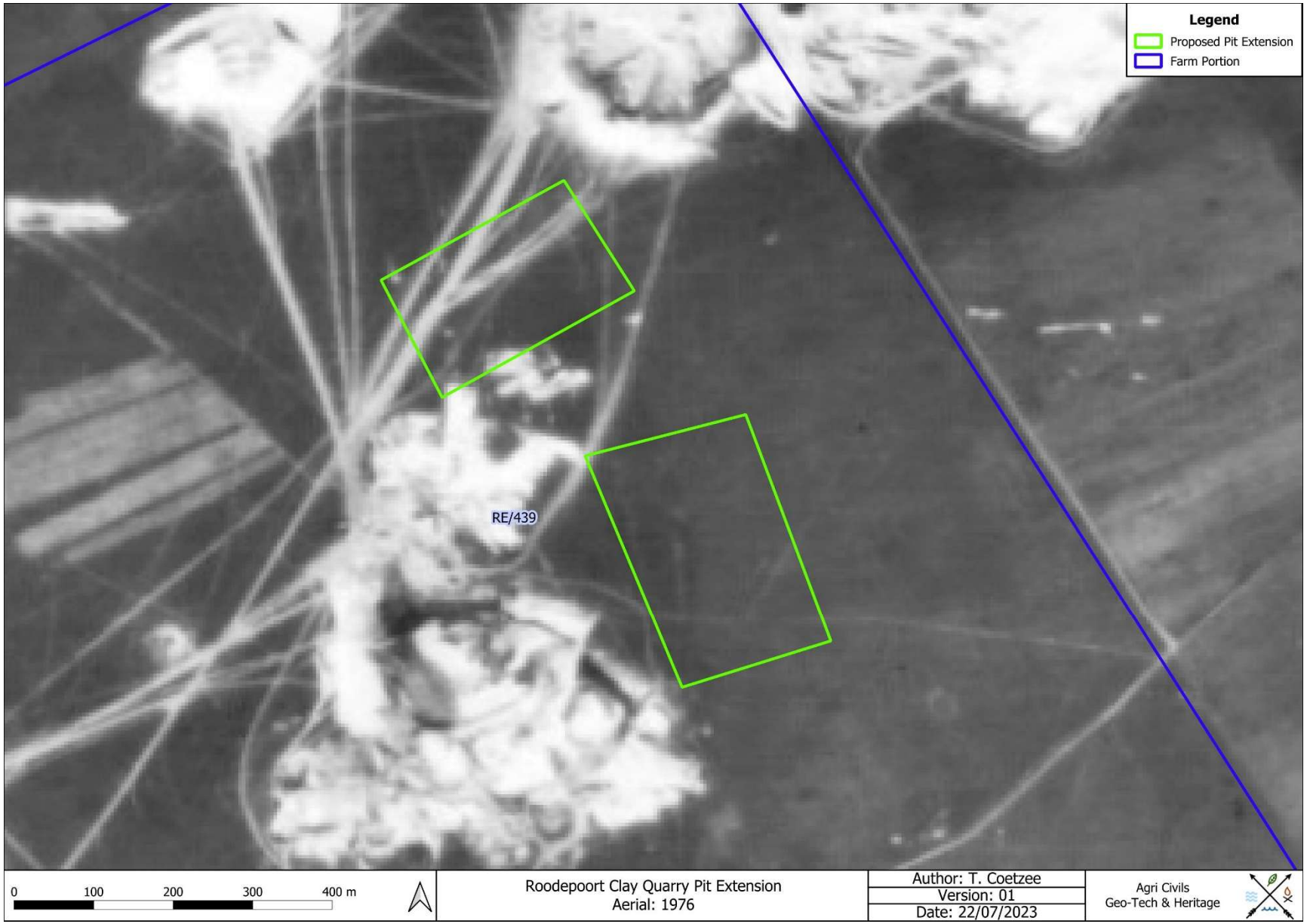


**Figure 22:** Study area superimposed on a 1976 aerial image.

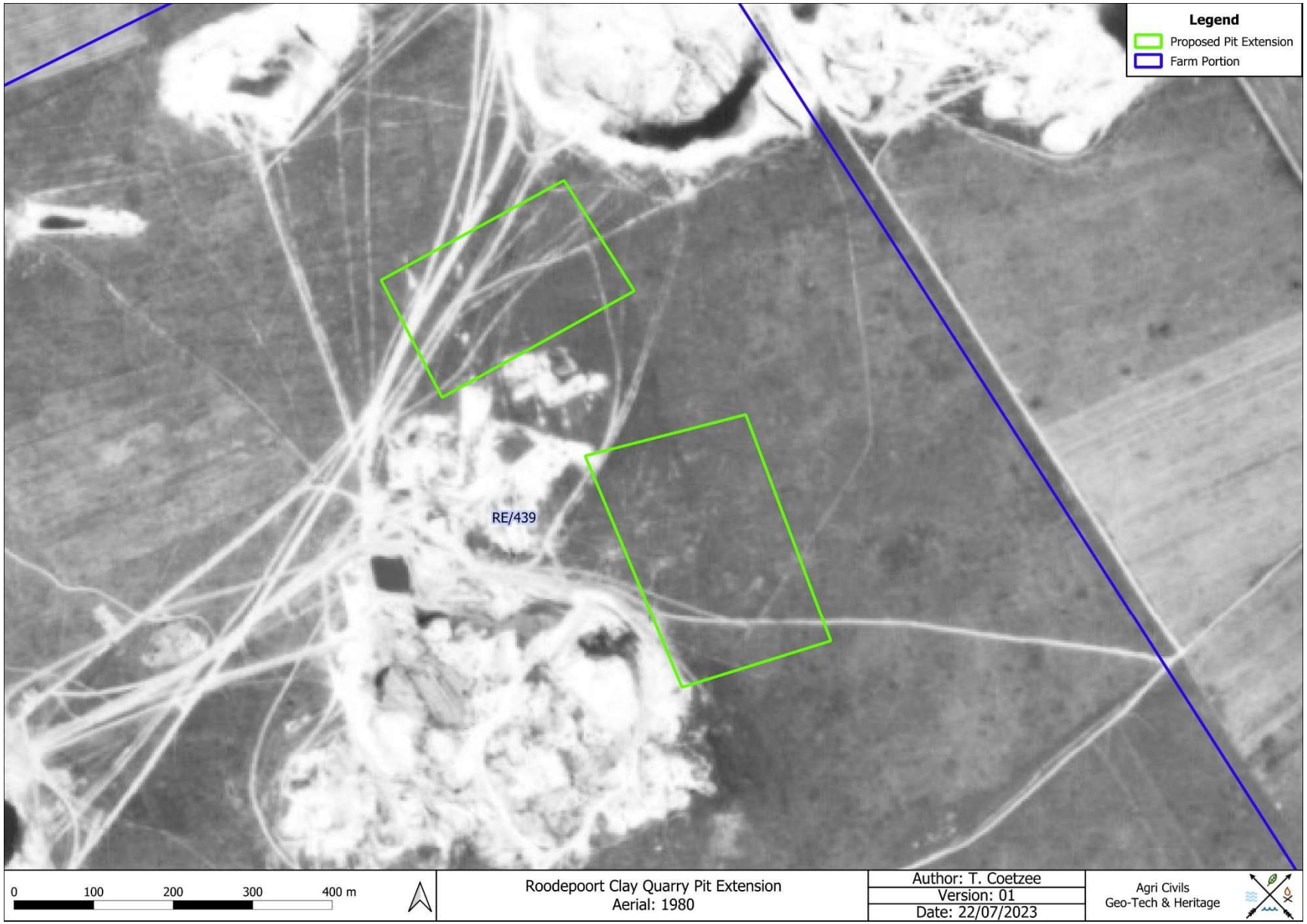


**Figure 23:** Study area superimposed on a 1980 aerial image.

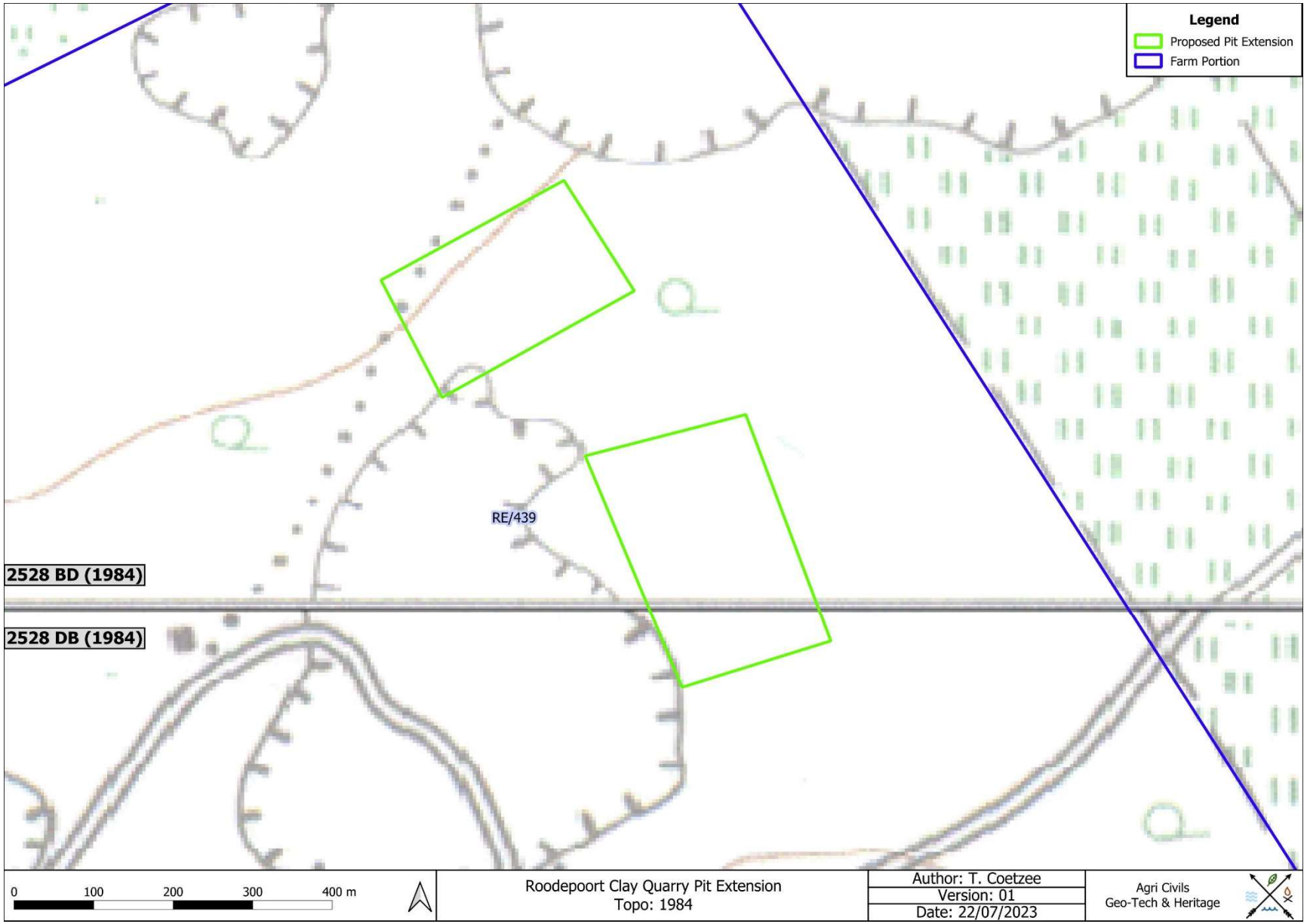


**Figure 24:** Study area superimposed on a 1984 topographical map.

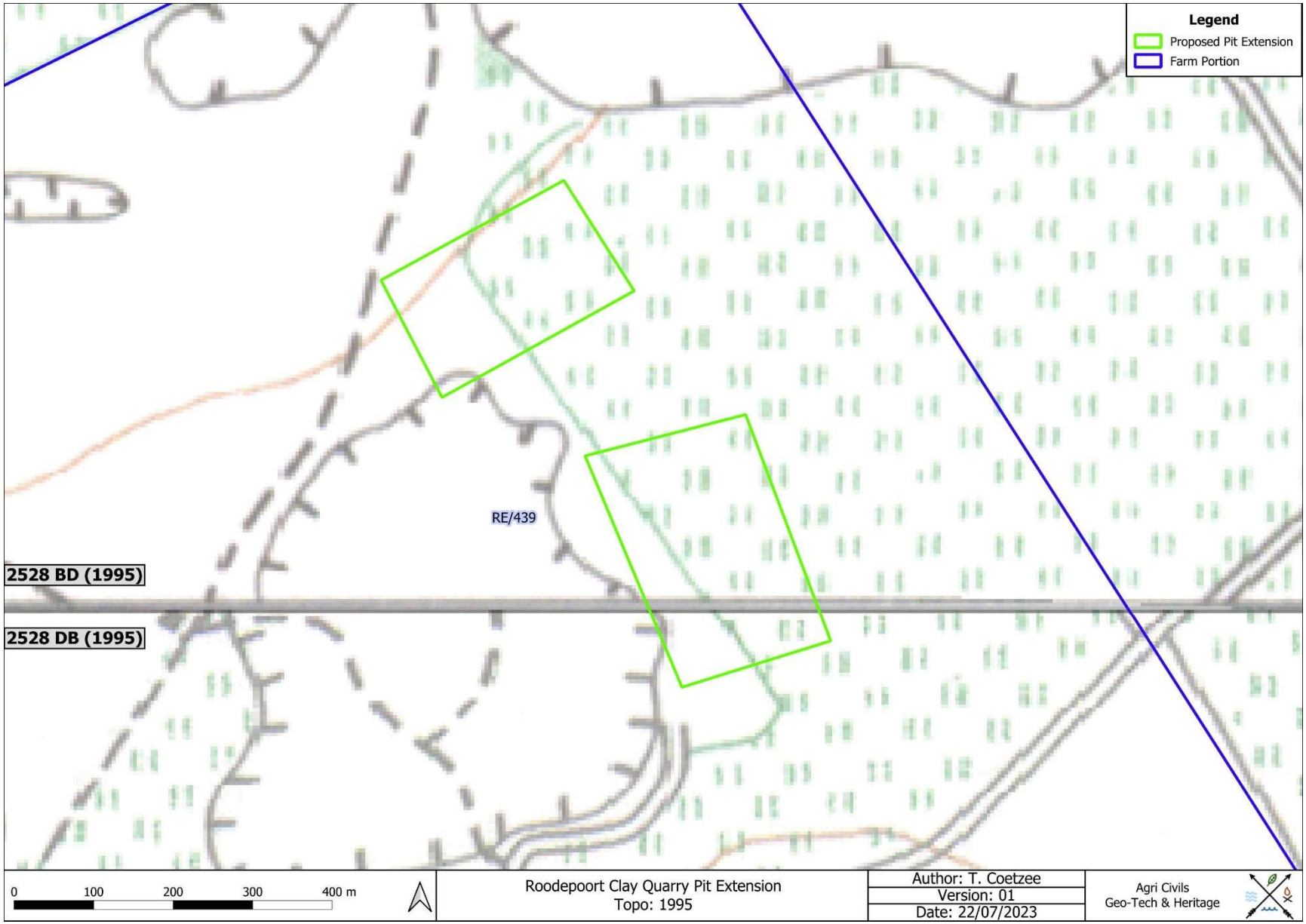


**Figure 25:** Study area superimposed on a 1995 topographical map.

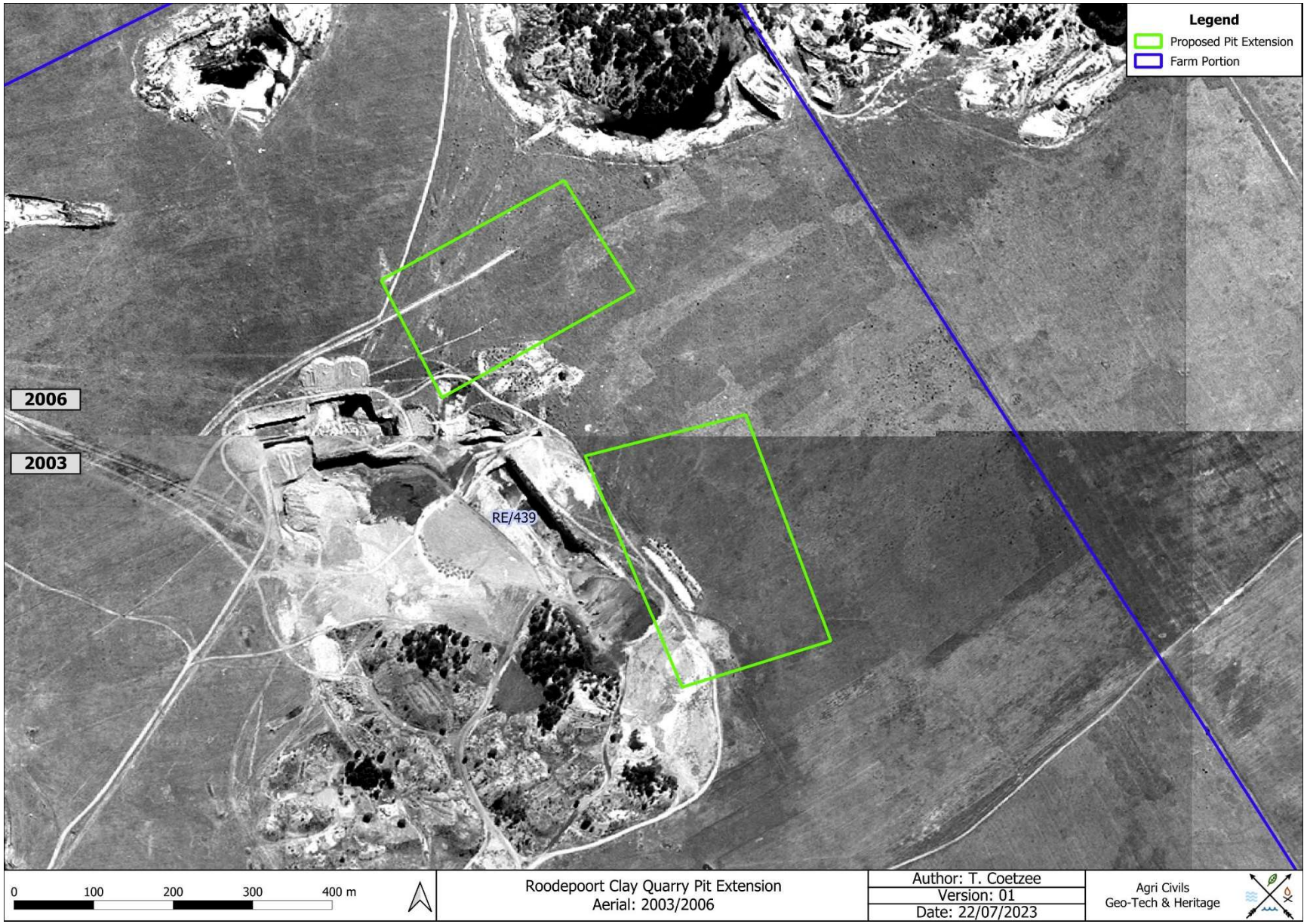


**Figure 26:** Study area superimposed on a 2003/2006 aerial image.

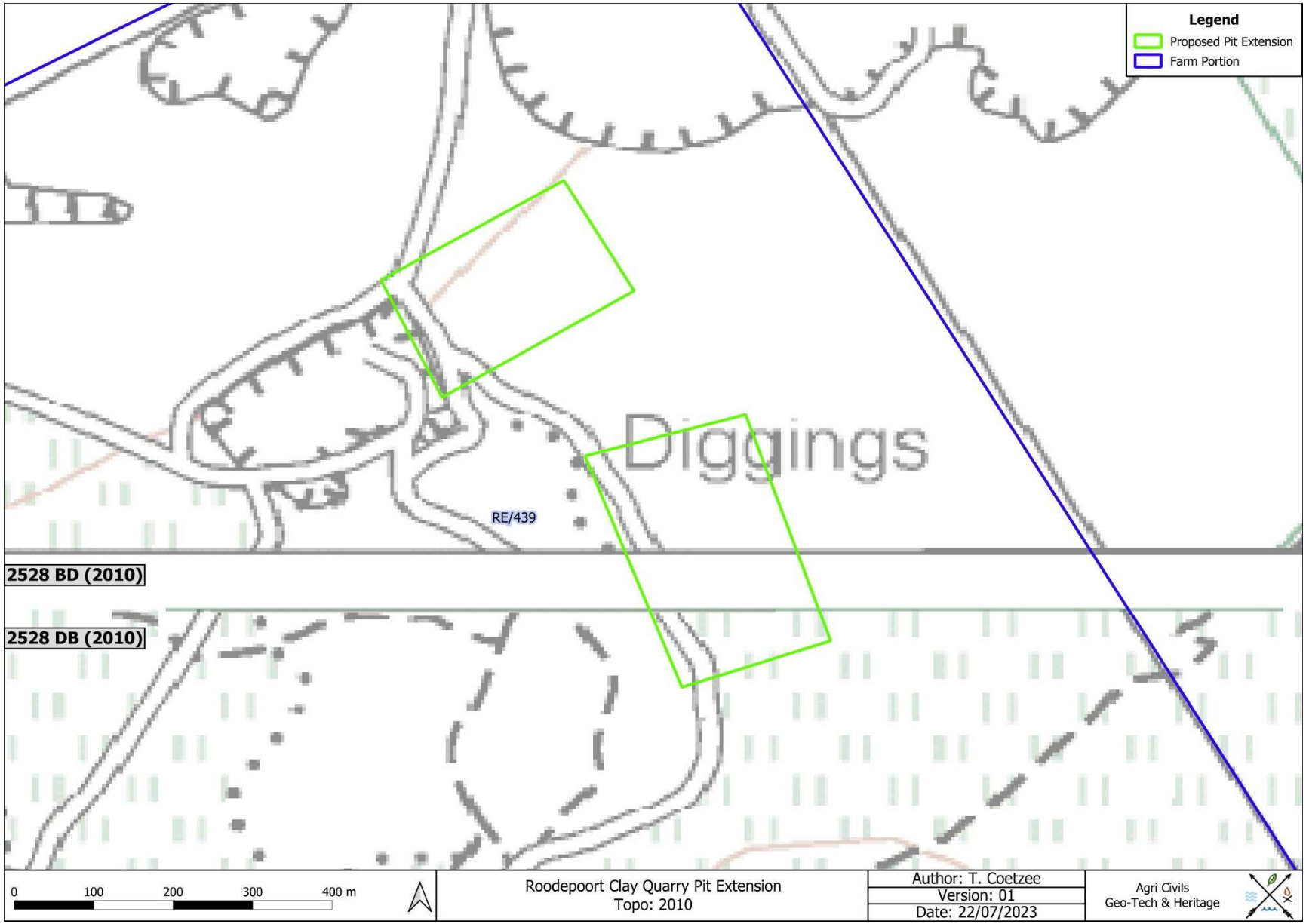


**Figure 27:** Study area superimposed on a 2010 topographical map.

# Appendix B: Impact Table

**v) Impacts and risks identified including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts**

This section includes the impact management for the proposed Roodepoort Clay Quarry Pit Extension Project.

**1 Surface and subsurface impact on heritage resources due to mining development**

Activity, nature, and consequence of impact:

During the development, construction and operational phases, surface and subsurface impacts take place. These activities can lead to irreparable damage or complete destruction of heritage resources if not correctly managed.

Cumulative impacts:

Based on current observations, no impact to heritage resources is foreseen.

Assumptions, uncertainties, and gaps in knowledge:

Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the mining phase.

Impact pre-mitigation:

| | Heritage sites | | |
|---|---|---|---|
| Intensity and magnitude | 1<br>The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated | | |
| Resource replaceability | 3<br>Resources will be completely lost | | |
| Duration | 1<br>The impact will be short-lived | | |
| Extent or spatial scale | 1<br>The impact will be site specific. | | |
| Probability | 1<br>It is unlikely that the impact will occur. | | |
| Significance | 7<br>Low | | |

Impact post-mitigation:

| | Heritage sites | | |
|---|---|---|---|
| Intensity and magnitude | 1<br>The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated | | |
| Resource replaceability | 2<br>Loss of resource can somewhat be replaced | | |
| Duration | 1<br>The impact will be short-lived | | |
| Extent or spatial scale | 1<br>The impact will be site specific. | | |
| Probability | 1<br>It is unlikely that the impact will occur. | | |
| Significance | 6<br>Low | | |

| **Environmental objective** |
|---|
| To ensure that heritage resources are not negatively impacted. |

| **Management measures to be applied** | **Phase applicable to management measure** | **Management tools** | **Monitoring programmes** | **Management timeframe and schedule** | **Responsibilities for implementation and long-term maintenance** | **Financial provision for long-term maintenance and/or environmental costs** | **Mitigation hierarchy** |
|---|---|---|---|---|---|---|---|
| Heritage awareness must be included in normal site induction for all employees, contractors and visitors to the subject properties. This will ensure that the general level of heritage awareness is raised and that there is compliance with the act. The sections of the NHRA must be highlighted to each visitor, contractor and employee or any other person acting on the sites or immediate surrounds. | Development, construction, operational | General awareness | Site inspections | Inspections during Development, construction, operational | ECO | None | General awareness |
| All actions on the property will be subject to the provisions of the NHRA and any transgressions of the act will make the transgressor liable in terms of the act. | Development, construction, operational. | NHRA | Site inspections | Inspections during Development, construction, operational | ECO | Only necessary if any resource is impacted | Prevent |
| The demarcated project boundaries must be enforced to limit the footprint of the impact of activities outside the project area. | Development, construction, operational | General awareness. | Site inspections. | Inspections during Development, construction, operational | ECO | None | Prevent |
| Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction 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 and construction phases, all activities must be | Development, construction, operational. | General awareness | Site inspections | Inspections during Development, construction, operational | ECO | Only necessary if any resource is found. | Prevent |

| Management measures to be applied | Phase applicable to management measure | Management tools | Monitoring programmes | Management timeframe and schedule | Responsibilities for implementation and long-term maintenance | Financial provision for long-term maintenance and/or environmental costs | Mitigation hierarchy |
|---|---|---|---|---|---|---|---|
| suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)). | | | | | | | |
| Prior to the commencement of any work or action that will impact or effect a heritage resource, the relevant authorisation must be obtained from SAHRA. | Planning | N/A. | N/A. | N/A. | N/A. | N/A. | N/A. |
| Where there is uncertainty with regard to the status of a heritage resource, object, place or artefact, or any legislative or other policy issue SAHRA can be contacted for clarity. | Development, construction, operational. | General awareness | Site inspections | Inspections during Development, construction, operational | ECO | Only necessary if any resource is found. | Prevent |

| **Stakeholder expectations and / or comments** |
|---|
| None received. |
| **Residual and latent risks** |
| If effective management takes place, there should not be residual impacts. No latent impacts foreseen. |

**Pre- and post-mitigation impacts per site (table1/2)**

| | | | | Impact pre-mitigation | | | | | | Impact post-mitigation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line No | Site No | Site Type | Activity | Intensity & Magnitude | Resource replaceability | Duration | Extent or spatial scale | Probability | Significance | Intensity & Magnitude | Resource replaceability | Duration | Extent or spatial scale | Probability | Significance |
| 1 | No potential heritage sites detected | None - Chance finds Procedure | Impact to heritage resources unlikely | 1 | 3 | 1 | 1 | 1 | **7 Low** Potential subsurface remains. | 1 | 2 | 1 | 1 | 1 | **6 Low** |

**Pre- and post-mitigation impacts per site (table2/2)**

| Line No | Environmental objective | Management measures to be applied | Phase applicable to management measure | Management tools | Monitoring programmes | Management timeframe and schedule | Responsibilities for implementation and long-term maintenance | Financial provision for long-term maintenance and/or environmental costs | Mitigation hierarchy | Residual and latent risks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | To ensure that heritage resources are not negatively impacted. | Chance finds procedure | All | Chance finds procedure | Ad Hoc monitoring of sub-surface material | Ad Hoc | ECO | None (based on current project boundary) | Prevent | If effective management takes place, there should not be residual impacts. No latent impacts foreseen |

**vi) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks**

**Impact assessment**

The methodology used to assess the significance of an impact is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Mining Activities that Require EA, of 2018, GN 86 in terms of NEMA. The impact significance methodology described below also complies to Appendix B of the Operational Guideline to Integrated Water and Waste Management of 2010 in terms of the NWA. In the event of any Section 21c&i water uses in terms of the NWA being assessed, Appendix A of the General Authorisations of 2016, GN 509 in terms of the NWA will be used to construct a risk matrix. Regulation 3(b) of the General Authorisations of 2016, GN 509 in terms of the NWA states that a suitably qualified SACNASP professional member must determine risks associated with this risk matrix.

Impact identification and prediction means forecasting the change of environmental parameters due to developmental patterns. These parameters may also be changing due to climate change and should be included.

Method of assessment: Impact identification and prediction is a stepwise procedure to identify the direct, indirect and cumulative impacts (relating to both positive and negative impacts) for which a proposed activity and its alternatives will have on the environment as well as the community. This should be undertaken by determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity aspects of sites and locations as well as the risk of impact of the proposed activity. Refer to part A(h)(iv) for a complete description of these environmental attributes. Sources of data to be used for gathering data on the environmental attributes as well as the impacts include; monitoring / sampling data collected and stored, assumptions and actual measurements, published data available from the departments or other stakeholders in the area as well as specialist studies. Likely impacts should be described qualitatively and then studied separately in detail. This provides consistent and systematic basis for the comparison and application of judgements.

Significance rating: Ratings should then be assigned to each criterion. Significance of impacts should be determined for each phase of the mining lifecycle this includes; preconstruction, construction, operational, closure (including decommissioning) and post closure phases. The significance of impacts should further be assessed both with and without mitigation action. The description of significance is largely judgemental, subjective and variable. However, generic criteria can be used systematically to identify, predict, evaluate and determine the significance of impacts resulting from project construction, operation and decommissioning. The process of determining impact magnitude and significance should never become mechanistic. Impact magnitude is determined by empirical prediction, while impact significance should ideally involve a process of determining the acceptability of a predicted impact to society. Making the process of determining the significance of impacts more explicit, open to comment and public input would be an improvement of environmental assessment practice. Impact magnitude and significance should as far as possible be determined by reference to either legal requirements (accepted scientific standards) or social acceptability. If no legislation or scientific

standards are available, the EAP can evaluate impact magnitude based on clearly described criteria. A matrix selection process is the most common methodology used in determining and ranking the site sensitivities:

- The consequence: includes the nature / intensity / severity of the impact, spatial extent of the impact, and duration of the impact.
    - The nature / intensity / severity of the impact: An evaluation of the effect of the impact related to the proposed development on the receiving environment. The impact can be either positive or negative. A description should be provided as to whether the intensity of the impact is high, medium, or low or has no impact in terms of its potential for causing negative or positive effects. Cognisance should be given to climate change which may intensify impacts.
    - The spatial extent of the impact: Indication of the zone of influence of the impact: A description should be provided as to whether impacts are either limited in extent or affect a wide area or group of people. Cumulative impacts must also be considered as the extent of the impact as may increase over time.
    - The duration of the impact: It should be determined whether the duration of an impact will be short-term, medium term, long term or permanent. Cumulative impacts must also be considered as the duration of the impact as it may increase over time.
- The likelihood: includes the probability of the potential occurrence of the impact, and frequency of the potential occurrence of the impact
    - The probability of the impact: The probability is the quality or condition of being probable or likely. The probability must include the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated
    - The frequency of the potential occurrence of the impact.
- The significance: This is worst case scenario without any management measures. See below how significance is determined: Impact that may have a notable effect on one or more aspects of the environment or may result in noncompliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence. Mitigation measures should be provided with evidence or motivation of its effectiveness

Example of significance rating:

Prior to mitigation

| | | | |
|---|---|---|---|
| Intensity and magnitude | 1<br>Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated. | 2<br>Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated | 3<br>Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated |
| Resource replaceability | 1<br>Loss of resource can be completely replaced. | 2<br>Loss of resource can somewhat be replaced. | 3<br>Resources will be completely lost. |
| Duration | 1<br>The impact will be short-lived. | 2<br>The impact will last for the entire operational life of the activity but will be mitigated thereafter. | 3<br>The impact will not cease after the operational life of the activity ceases but will be permanent. |
| Extent or spatial scale | 1<br>The impact will be site specific. | 2<br>The impact will affect the local area. | 3<br>The impact will affect an area larger than just the local area. |
| Probability | 1<br>It is unlikely that the impact will occur. | 2<br>There is a probability for the impact to occur. | 3<br>The impact will definitely occur. |
| Significance | None or low<br>If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3. | Medium<br>If the sum of the above ranking is equal or more than 8 to 11. | High<br>If the sum of the above ranking is 12 or more. |

Post to mitigation

| | | | |
|---|---|---|---|
| Intensity and magnitude | 1<br>Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated. | 2<br>Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated | 3<br>Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated |
| Resource replaceability | 1<br>Loss of resource can be completely replaced. | 2<br>Loss of resource can somewhat be replaced. | 3<br>Resources will be completely lost. |
| Duration | 1<br>The impact will be short-lived. | 2<br>The impact will last for the entire operational life of the activity but will be mitigated thereafter. | 3<br>The impact will not cease after the operational life of the activity ceases but will be permanent. |
| Extent or spatial scale | 1<br>The impact will be site specific. | 2<br>The impact will affect the local area. | 3<br>The impact will affect an area larger than just the local area. |
| Probability | 1<br>It is unlikely that the impact will occur. | 2<br>It is likely for the impact to occur. | 3<br>The impact will definitely occur. |
| Significance | None or low<br>If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3. | Medium<br>If the sum of the above ranking is equal or more than 8 to 11. | High<br>If the sum of the above ranking is 12 or more. |

**Mitigation and management**

Management methodology is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Mining Activities that Require EA, of 2018, GN 86 in terms of NEMA; and the Mining and Biodiversity Guideline (Mainstreaming Biodiversity into the Mining Sector) IDB of 2013 in terms of the MPRDA.

Management statements detail the processes, procedures and practices required to achieve an impact management outcome. A hierarchy of management tools used can also be used as seen below.


Mitigation should include measures in the following order of priority. The aim is to prevent adverse impacts from happening or, where this is unavoidable, to limit their significance to an acceptable level.


<u>Avoiding or preventing impacts</u>

If the biodiversity (an ecosystem, habitat for threatened species, ecological corridor or area that provides essential ecosystem services) is of conservation value or importance, it is best to plan to avoid or prevent impacts altogether by changing the location, siting, method or processes of the mining activities and related infrastructure.

Minimising impacts

Minimising impacts of mining is a mitigation measure that deals with the environment in general. In areas where the biodiversity is to be affected is of conservational value or importance, then every effort should be made to minimise those impacts that cannot be avoided or prevented. Mining companies should strive to minimise impacts on biodiversity to ensure environmental protection. Section 2 of NEMA contains environmental management principles that resonates with minimising the impact rather than stopping at mitigation, this is imperative in the mining sector.

Rehabilitating impacted areas

Rehabilitation is the measures that are undertaken to "as far as it is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which aligns to the generally accepted principle of sustainable development. A closure plan is an essential part of rehabilitation and must be developed based on the establishment of the closure objectives and criteria.

Biodiversity offsets

Biodiversity offsets are measurable conservation gains that help to balance any significant biodiversity losses that remain after actions to avoid, minimise and restore negative impacts have been taken. They are the last stage of mitigation and should be considered after appropriate avoidance, minimisation, and rehabilitation/restoration measures have been applied already.

When dealing with management, impact management outcomes must:

- be set for the expected activity-based impacts;
- describe the desired outcome of the management measure/s prescribed or the standard to be achieved (environmental objective);
- be clearly documented and identified per project phase as in the impact identification and significance rating process (this must be aligned to the mines closure objectives, and must therefore include predicted long-term result of the applied management measures);
- be measurable to determine compliance, which includes time frames and schedule for the implementation of the management measures; responsibilities for implementation and long-term maintenance of the management measures; financial provision for long-term maintenance; and monitoring programmes to be implemented;
- be informed by stakeholder expectations; and
- ensure legal compliance;

Finally, the impact assessment must refer to the residual and latent impact after successful implementation of the management measure