ARCHAEOLOGICAL IMPACT ASSESSMENT

FOR THE PROPOSED BRONKHORSTSPRUIT SIDING

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Zantow Environmental Consulting Services

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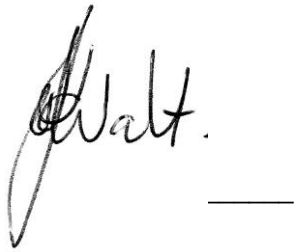
SIGNATURE: 

EXECUTIVE SUMMARY

Site name and location: The proposed Bronkhorstspruit Siding is located on portions 24 and 25 of the farm Hondsrivier 508 JR, Bronkhorstspruit, Gauteng.

1: 50 000 Topographic Map: 2528 DC.

EIA Consultant: Zantow Environmental Consulting Services

Developer: Canyon Resources (Pty) Ltd

Heritage Consultant: Heritage Contracts and Archaeological Consulting CC (HCAC).
Contact person: Jaco van der Walt Tel: +27 82 373 8491 E –mail jaco.heritage@gmail.com.

Date of Report: 7 July 2016.

Findings of the Assessment:

HCAC was appointed to assess the study area in terms of the archaeological component of Section 35 of the NHRA as part of the basic assessment for the project. The study area consists of an existing railway siding that would have destroyed any surface indicators of archaeological sites. No raw material suitable for stone tool manufacture occurs in the general study area and no ceramics or stone walls attributed to the Iron Age were recorded. Similarly no sites of archaeological significance were recorded by other studies in the area (e.g. Coetzee 2008, Van der Walt 2008 and Kusel 2009). No further mitigation prior to construction is recommended in terms of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), various features including the railway lines and electrical infrastructure date back to the 1950's and are therefore protected by the Act.

In terms of Section 36 of the Act no burial sites were recorded in the study area. However if any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. Due to the subsurface nature of archaeological remains and the fact that graves can occur anywhere on the landscape, it is recommended that a chance find procedure is implemented for the project as part of the EMP

The study area is surrounded by industrial and residential developments and no significant cultural landscapes or viewscapes were noted during the fieldwork.

Based on approval from SAHRA and adherence to the recommendations in this report there is from an archaeological point of view no reason why the development cannot commence.

General

The possibility of unmarked or informal graves and subsurface finds cannot be excluded. If any possible finds are made during construction, the operations must be stopped and a qualified archaeologist contacted for an assessment of the find/s.

Disclaimer:

Although all possible care is taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Heritage Contracts and Archaeological Consulting CC and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

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FIGURES

ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BIA: Basic Impact Assessment
CRM: Cultural Resource Management
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Plan
ESA: Early Stone Age
GPS: Global Positioning System
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA: National Environmental Management Act
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)
Early Stone Age (~ 2.6 million to 250 000 years ago)
Middle Stone Age (~ 250 000 to 40-25 000 years ago)
Later Stone Age (~ 40-25 000, to recently, 100 years ago)
The Iron Age (~ AD 400 to 1840)
Historic (~ AD 1840 to 1950)
Historic building (over 60 years old)

1 BACKGROUND INFORMATION

Heritage Contracts and Archaeological Consulting CC (**HCAC**) was appointed to conduct an Archaeological Impact Assessment for the proposed Bronkhorstspruit siding project as part of the Basic Assessment process.

The aim of the study is to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilized before and during the survey, which includes: Phase 1, a desktop study that includes collection from various sources and consultations; Phase 2, the physical surveying of the study area on foot and by vehicle; Phase 3, reporting the outcome of the study.

General site conditions were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to the SAHRA for review.

1.1. Terms of Reference

Desktop study
Conduct a brief desktop study where information on the area is collected to provide a background setting of the archaeology that can be expected in the area.

Field study
Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

Reporting
Report on the identification of anticipated and cumulative impacts the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with Heritage legislation and the code of ethics and guidelines of ASAPA.

To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

1.2. Archaeological Legislation and Best Practice

Phase 1, an AIA or a HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of a heritage specialist input is to:

- Identify any heritage resources, which may be affected;
- Assess the nature and degree of significance of such resources;
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess the negative and positive impact of the development on these resources;
- Make recommendations for the appropriate heritage management of these impacts.

The AIA or HIA, as a specialist sub-section of the EIA, is required under the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 23(2) (b) of the NEMA and section S. 39 (3) (b) (iii) of the MPRDA.

The AIA should be submitted, as part of the EIA, BIA or EMP, to the PHRA if established in the province or to SAHRA. SAHRA will be ultimately responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the EIA, BIA/EMP, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level).

Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIA's are primarily concerned with the location and identification of sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation of a site, a destruction permit must be applied for from SAHRA by the client before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

1.3. Description of Study Area

1.3.1 Location Data

The study area is situated approximately 1 km north of the Bronkhorstspruit CBD in the City of Tshwane Metropolitan Municipality, Gauteng Province. The study area is directly accessible from the 513 provincial road (Figure 1). The study area is located at 28.7401891427, -25.7947305799 and 28.7510279097, -25.7933722889.

The vegetation and landscape is described by Mucina and Rutherford (2006) as moderately undulating plains and low hills characterised by Bankeveld grassland.

1.3.2. Location Map

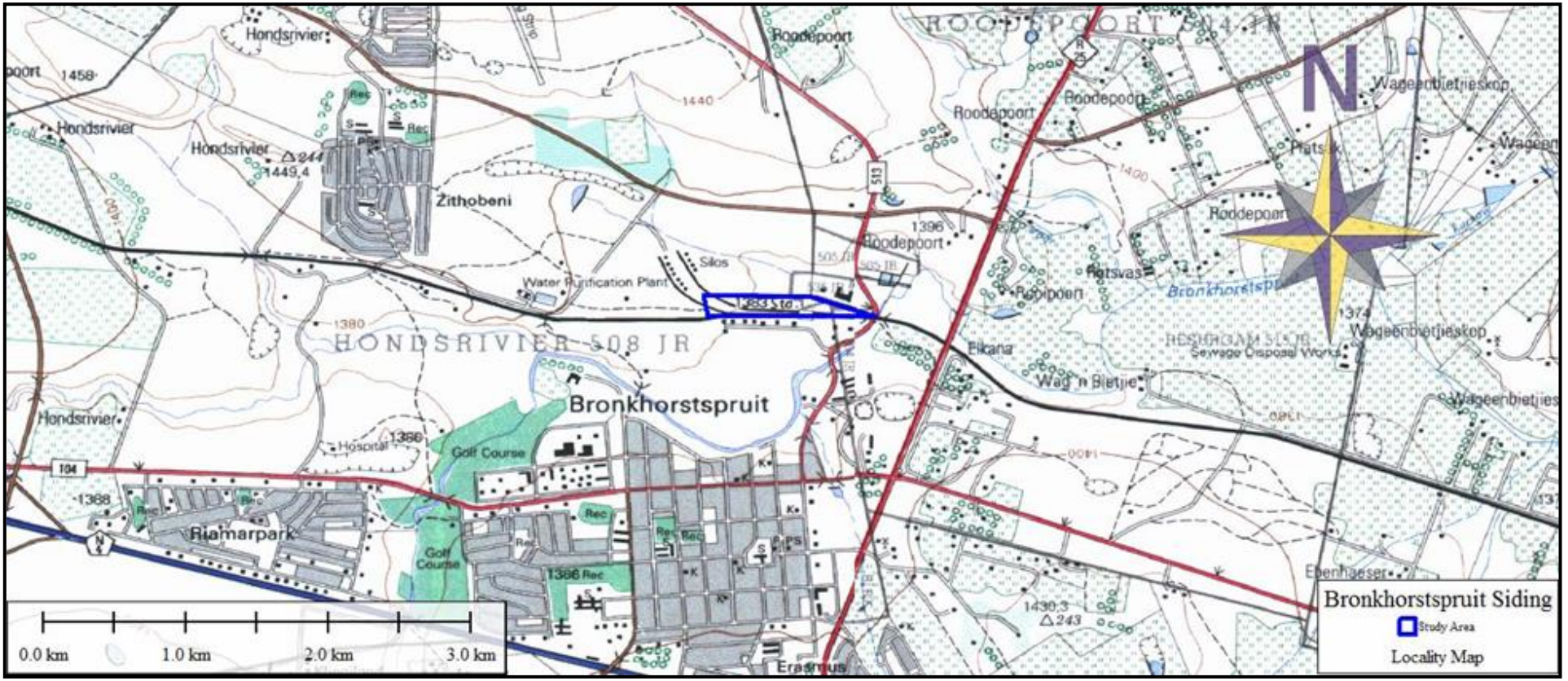


Figure 1. Location map

2. APPROACH AND METHODOLOGY

The aim of the study is to cover archaeological databases to compile a background of the archaeology that can be expected in the study area followed by field verification; this was accomplished by means of the following phases.

2.1 Phase 1 - Desktop Study

The first phase comprised desktop, scanning existing records for archaeological sites, historical sites, graves, architecture (structures older than 60 years) of the area. The following approached was followed:

2.1.1 Literature Search

This was conducted by utilising data stored in the national archives and published reports relevant to the area. The aim of this is to extract data and information on the area in question.

2.1.2 Information Collection

SAHRIS was consulted to collect data from previously conducted CRM projects in the region to provide a comprehensive account of the history of the study area.

2.1.3 Consultation

No public consultation was done by the author as this was done independently as part of the BA.

2.1.4 Google Earth and Mapping Survey

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located.

2.1.5 Genealogical Society of South Africa

The database of the Genealogical Society was consulted to collect data on any known graves in the area.

2.2 Phase 2 - Physical Surveying

Due to the nature of cultural remains, the majority of which occurs below surface, a field survey of the proposed development was conducted. The study area was surveyed by means of vehicle and extensive pedestrian surveys in July 2016.

The survey was aimed at covering the proposed development footprint, focussing on specific areas on the landscape that would be more likely to contain archaeological and/or other heritage remains like drainage lines, rocky outcrops as well as slight elevations in the natural topography. These areas were searched more intensively, but many other areas were walked in order to confirm expectations in those areas. Track logs of the areas covered were taken (Figure 2).

Figure 2. Track logs of the areas surveyed indicated in black with the development footprint indicated in blue.

2.3. Restrictions

Due to the subsurface nature of archaeological artefacts, the possibility exists that some features or artefacts may not have been discovered/ recorded during the survey and the possible occurrence of unmarked graves and other cultural material cannot be excluded. This report only deals with the footprint area of the proposed development as indicated in the location map.

Although HCAC surveyed the area as thoroughly as possible, it is incumbent upon the developer to stop operations and inform the relevant heritage agency should further cultural remains, such as graves, stone tool scatters, artefacts, bones or fossils, be exposed during the process of development.

3. NATURE OF THE DEVELOPMENT

Canyon Resources proposes to develop and operate a coal loading and transportation facility within the existing Bronkhorstspruit Rail Siding in the Gauteng Province. The proposed facility will be used to receive and dispatch coal from the Khany Colliery, located 6 km East of the siding, for approximately 17 years. The coal product will be transported by means of the existing road network to the proposed coal siding.

The following infrastructure currently exists at the station:

- Railway tracks;
- Locomotives and wagons;
- Overhead traction equipment (OHTE);
- Concrete loading area;
- Access roads; and
- Supportive buildings.

Canyon proposes to convert the current siding and install the following infrastructure:

- Coal siding and stockpile area

Existing tracks will be upgraded to Transnet Freight and Rail (TFR) specifications for the loading of coal product. No additional tracks will be constructed during this process. The coal stockpiling area will be designed to accommodate a maximum 12 000 tons of coal product. To prevent any contamination of groundwater, an appropriate liner will be installed at the stockpile area and runoff will be diverted to a pollution control dam (PCD).

- Gravel haul roads

Internal gravel haul roads will be constructed for the movement of material to and from the coal loading facility.

- Pollution Control Dam (PCD)

The PCD will be designed to accommodate a 50 year flood event. Other design specifications are:

  - A freeboard of 0.08m;
  - A 2mm thick high-density polyethylene (HDPE) lining;
  - Concrete lined inlets and outlets; and

- A silt trap positioned upstream of the PCD.

- Storm water management system for the management of storm water and contaminated runoff

A storm water management system for the management of storm water and contaminated runoff around the coal stockpile and siding will be constructed. Surface water from the stockpile will be collected in concrete lined drains located within the stockpile area. The contaminated water diverted to the lined drains will pass through a silt trap located at the inlet of the PCD.

During the planning phase, it was found that the existing Stormwater infrastructure will not be able to accommodate a 1 in 50 year flood event. It is therefore proposed that a cut of trench (approximately 1km in length) be constructed upstream (North) of the siding to ensure that uncontaminated stormwater flows along the northern boundary of the existing mill. This will be done to prevent the contamination of water from high rainfall events. It is proposed that the cut-off trench will not alter the current hydrology of the area.

- Rail operations

TFR Rail Operations prescribes specifically that the following two criteria will have to be adhered to after/during construction of the new siding facility:

1. The siding must accommodate a 100 truck train.
2. Shunting to and from the TFR Main Line will not be tolerated. The placing of wagons by the TFR locomotives must only incorporate one shunt.

The southern track of the proposed loading area can accommodate 60 wagons. The northern track can accommodate 50 wagons. Therefore the siding has the capacity to ensure the above requirements will be adhered to.

- Road traffic

The proposed loading area where the coal will be stockpiled is 21m wide, of which 6m is required for the Front End Loaders to work in on both the southern and northern side. The remaining area for coal stockpiling is therefore 9m wide, assuming that the coal will not be stockpiled higher than 2m. The volume of coal that the loading area can accommodate is less than 12 000 tons.These coal stockpiles will be created by running side-discharge road trucks in an anti-clockwise direction through the loading platform. The siding management will ensure that stockpiling will only occur when there is no train trucks parked for loading and a train entering the siding area will ensure that no stockpiling takes place. Therefore, there can be no conflicting movements of train and road going vehicles.

4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA

4.1 Databases Consulted

Several previous studies are on record for the general study area. The following studies were consulted for this report.

Author	Year	Project Name	Findings
Van der Walt, J.	2007	Archaeological impact assessment Wachtenbietjeskop Eco – Estate. Located on portion 79 of the farm Wachtenbietjeskop 506 JR, Bronkhorstspruit Gauteng Province	Stone walled sites, a historical structure as well as a cemetery.
Van der Walt, J.	2008	Archaeological Impact Assessment For The Proposed Bronkhorstspruit Primary School, Riamar Park, Gauteng Province	No heritage sites were found.
Coetzee, F. P.	2008	Cultural Heritage Survey of the Proposed Riverwalk Township Development on the Remainder of the Farm Roodepoort 504JR, Gauteng Province	No sites of heritage significance were recorded.
Kusel, U.	2009	Phase I Cultural Heritage Resources Impact Assessment Of Remainder Of Portion 4 Of The Farm Roodepoort 504 Jr Bronkhorstspruit Gauteng Province (37.2 hectare).	Structures of low significance
Du Piesanie, J.	2014	NID for the Proposed Oakleaf Opencast Coal Mine, Gauteng	Structures and a cemetery as well as a potential paleontological site.

Genealogical Society and Google Earth Monuments

No cemeteries are indicated for the farm under investigation.

4.2. Brief background to the study area

A farm does not exist in isolation and the history of the surrounding area will be briefly discussed. Sources for the history of the area surrounding the study area include secondary source material, maps, electronic sources, and archival documents. A brief history of human settlement from the source of J. S. Bergh (1999) will be used to write a short history of the area.

4.2.1. Historical background of the area

This report includes the history of the following area: a section of land including the Remaining Extent of Portion 24 and the Remaining Extent of Portion 25 of Hondsrivier 508 JR, Bronkhorstspruit, Gauteng Province.

The following report is an account of the history of this section of land and also a brief overview of the history of the area and district in which it is located. The report has been divided into sections that will focus on the following aspects:

- General history of human settlement in the area
- A history of specific land ownership and development, where this could be traced

It was necessary to use a range of sources in order to give an account of the history of the study area. Sources include secondary source material, maps and archival documents. This study should be viewed as an introduction to the history of the area under investigation.

The following archival documents can perhaps be consulted if a further study of the area is done:

DEPOT TAB
SOURCE TPB
TYPE LEER
VOLUME_NO 1811
SYSTEM 01
REFERENCE TA2/14138
PART 1
DESCRIPTION BRONKHORSTSPRUIT VILLAGE COUNCIL. CLOSING OF ROAD ON PORTION OF **HONDERIVIER** NO 361.
STARTING 1937
ENDING 1938

DEPOT SAB
SOURCE LEM
TYPE LEER
VOLUME_NO 302
SYSTEM 01
REFERENCE 2468
PART 1
DESCRIPTION MA MARGOW, **HONDERIVIER** 361, BRONKHORSTSPRUIT.
STARTING 19370000
ENDING 19390000

DEPOT SAB
SOURCE VBW
TYPE LEER
VOLUME_NO 526
SYSTEM 01

REFERENCE 13/1/4/4011/10
PART 1
DESCRIPTION AANSOEK OM GROEPSGEBIEDE PERMITTE. DORPSGEBIEDE. BRONKHORSTSPRUIT. BEOOGDE HOSPITAAL. PLAAS **HONDRIVIER.**
STARTING 19870000
ENDING 19870000

4.2.2. Maps of the area under investigation

Since the mid-1800s up until the present, South Africa has been divided and re-divided into various different districts. Since 1857, the farm under investigation formed part of the Pretoria district. As of 1902 the property fell within the ward Bronkhorstspruit within the Pretoria district. This remained the case up until 1977, when South Africa was divided into various smaller magisterial districts. The farm area became part of the Bronkhorstspruit magisterial district. Today, this farm forms part of the Tshwane Metro within the Gauteng Province. (Geskiedenisatlas van Suid-Afrika 1999: 17; 25-27)

Note that, by 1902 the property under investigation was known as Hondsrivier 361. By the early 1950s, the farm was known as Hondsrivier 189. By 1960 the property had been renamed Hondsrivier 508 JR. (Major Jackson Series 1902; NASA *SAB, CDB: 3/468 TAD6/14;* NASA *SAB, URU: 4131 3080*)

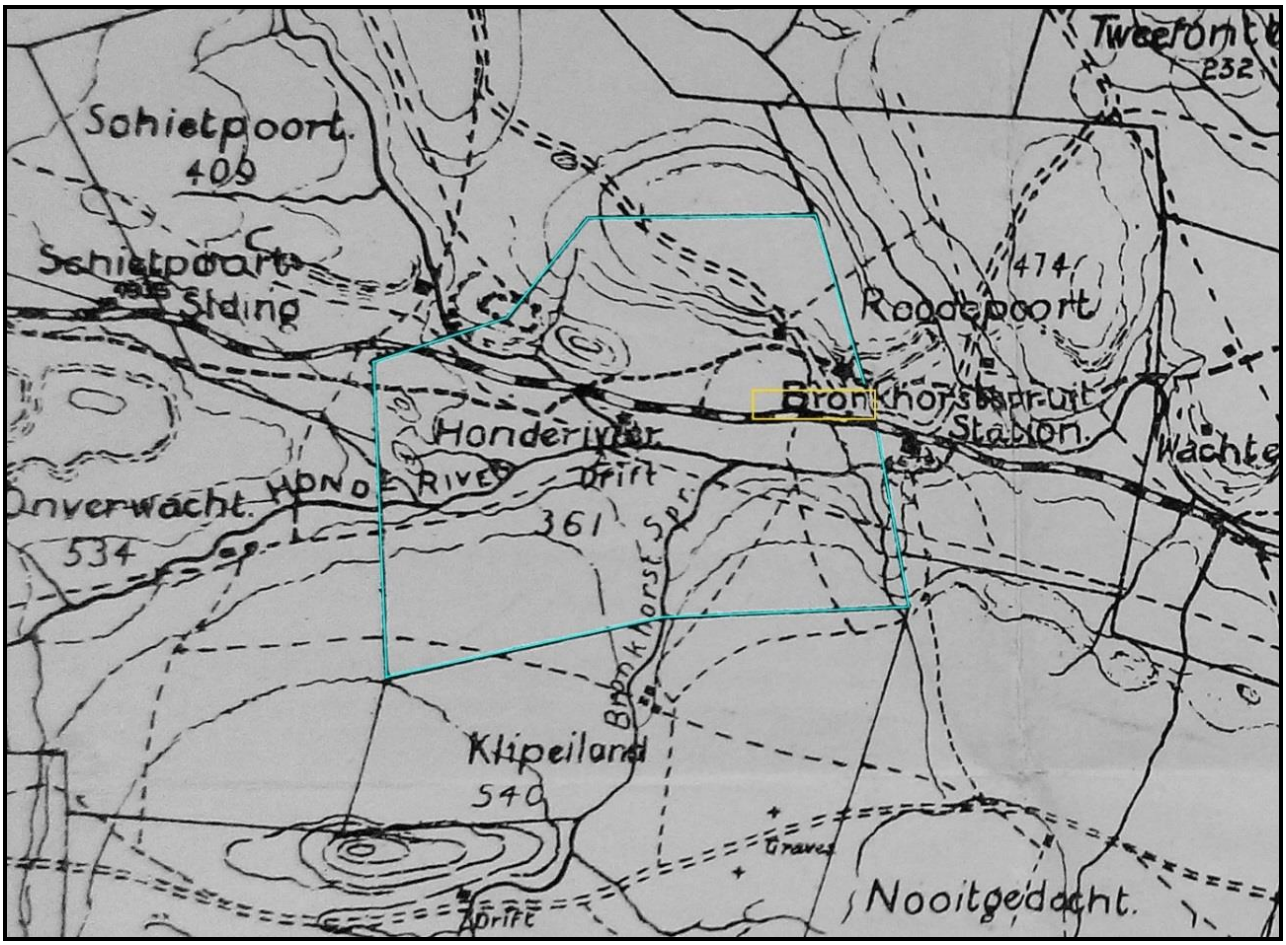


Figure 3._1902 Major Jackson Map of the Pretoria-Middelburg district. The blue border indicates the location of the farm known as Honderivier 361. The yellow border indicates the approximate location of the study area. One can see that a number of ordinary roads, as well as a main road intersected the property. A railway also traversed the property, and to the south thereof one can see the confluence of the Honderivier and the Bronkhorstspruit rivers. Two homesteads are visible just to the north of the area under investigation, and by this time the Bronkhorstspruit Station had been established in the study area. The main road also seems to traverse the study area. (Major Jackson Series 1902)

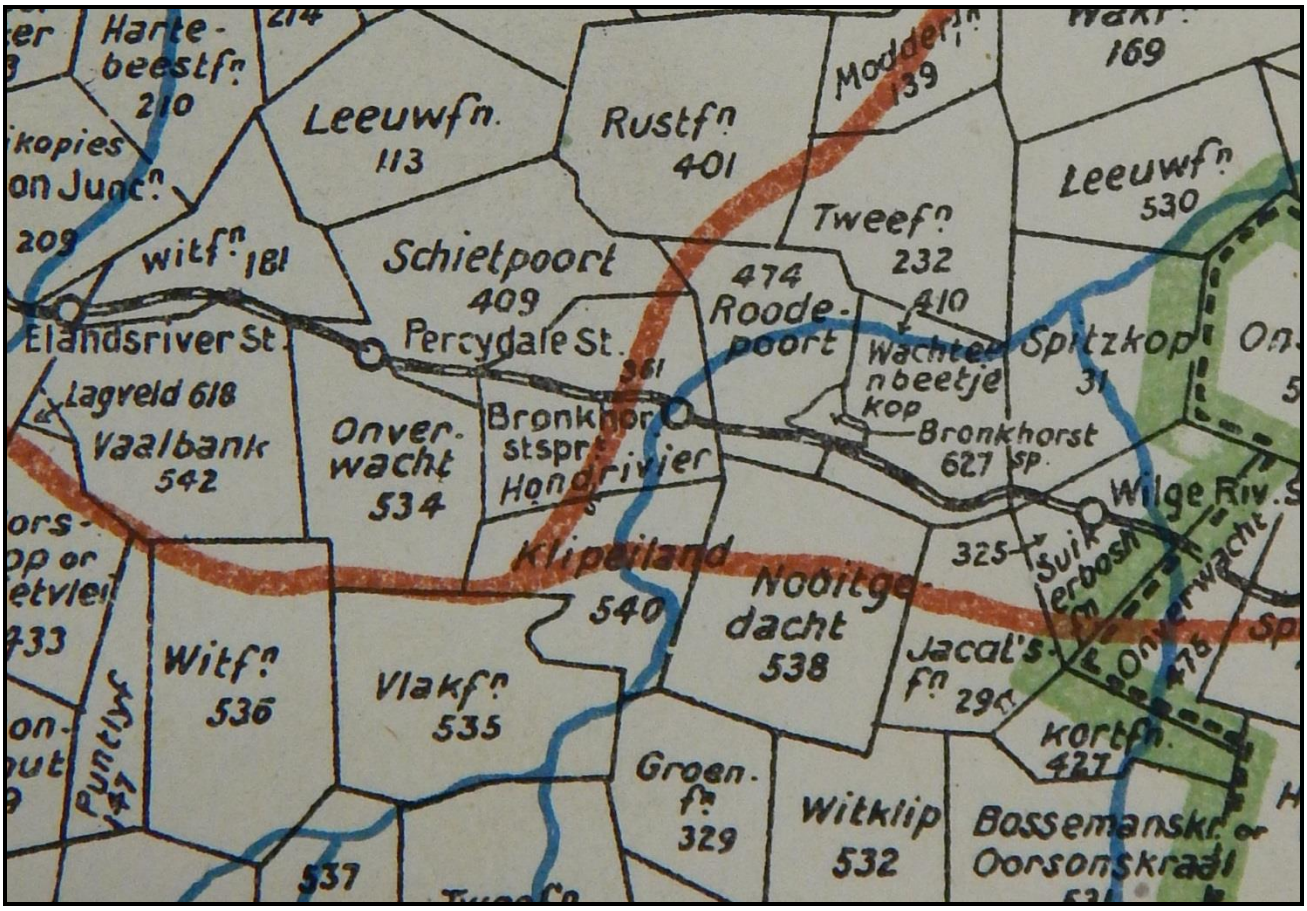


Figure 4. By the 1920s, Hondrivier 361 formed part of the Pretoria district. This map indicates how this property was still intersected by a main road and a railway line. (Anon 1920s)

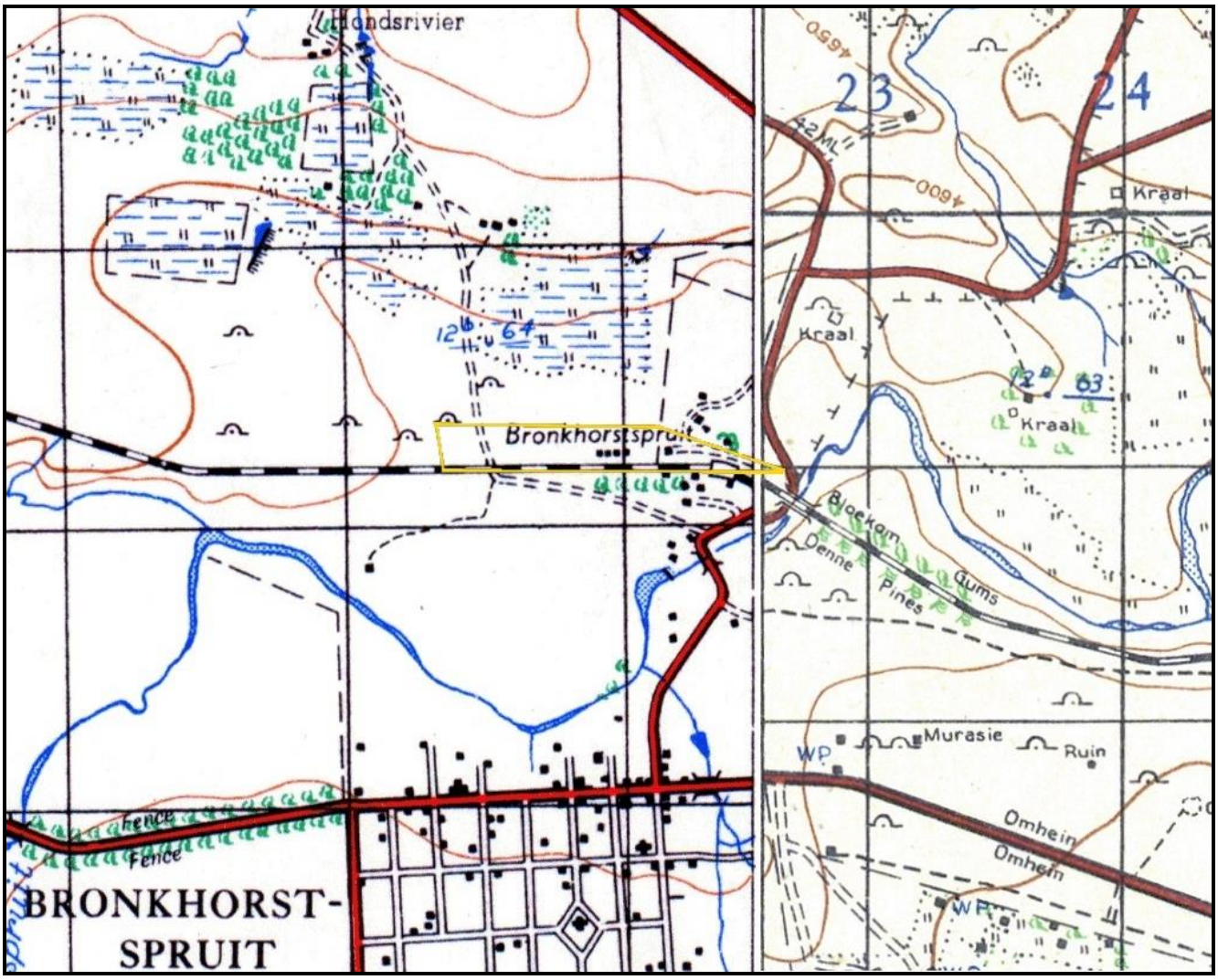


Figure 5. 1944 and 1941 topographical maps of the area under investigation. By this time the farm boundaries have not yet been drawn in. The study area is indicated with a yellow border. One can see that developments on this section of Hondsrivier 361 included a railway, the Bronkhorstspruit Station, two secondary roads and five buildings/homesteads. A number of huts/traditional black homesteads can be seen to the west and northwest of the study area. To the east, a main road is visible. A number of homesteads can be seen south of the railway station. The town of Bronkhorstspruit is located close by, to the south of the study area. (Topographical Map 1944; Topographical Map 1941)

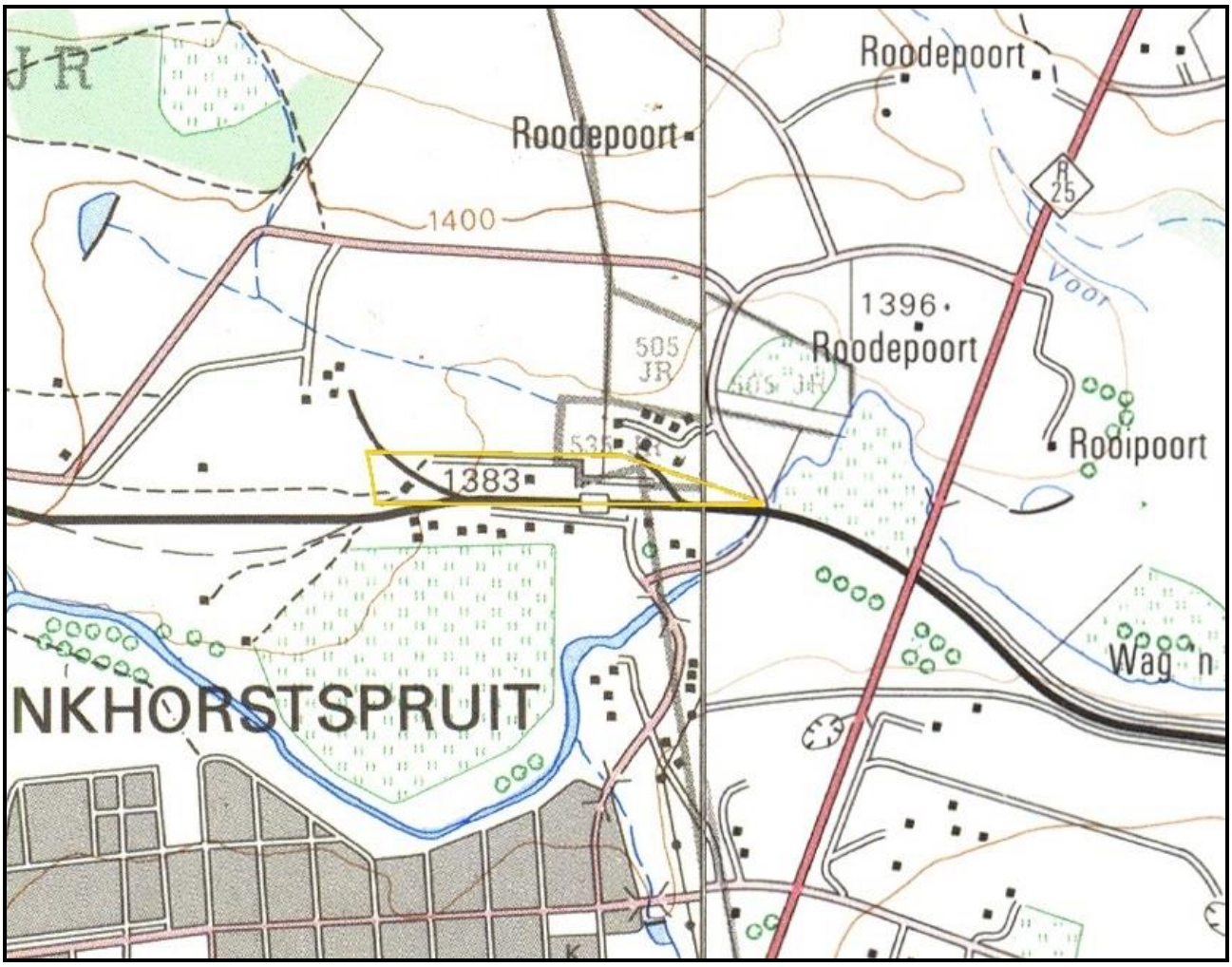


Figure 6. 1984 Topographical map of the area under investigation. The Bronkhorstspruit train station, some secondary roads and a dirt road can be seen within the study area. Only two buildings/homesteads are now visible within the study area. Several buildings are visible to the north and south of the area under investigation. Topographical Map 1984; Topographical Map 1984)

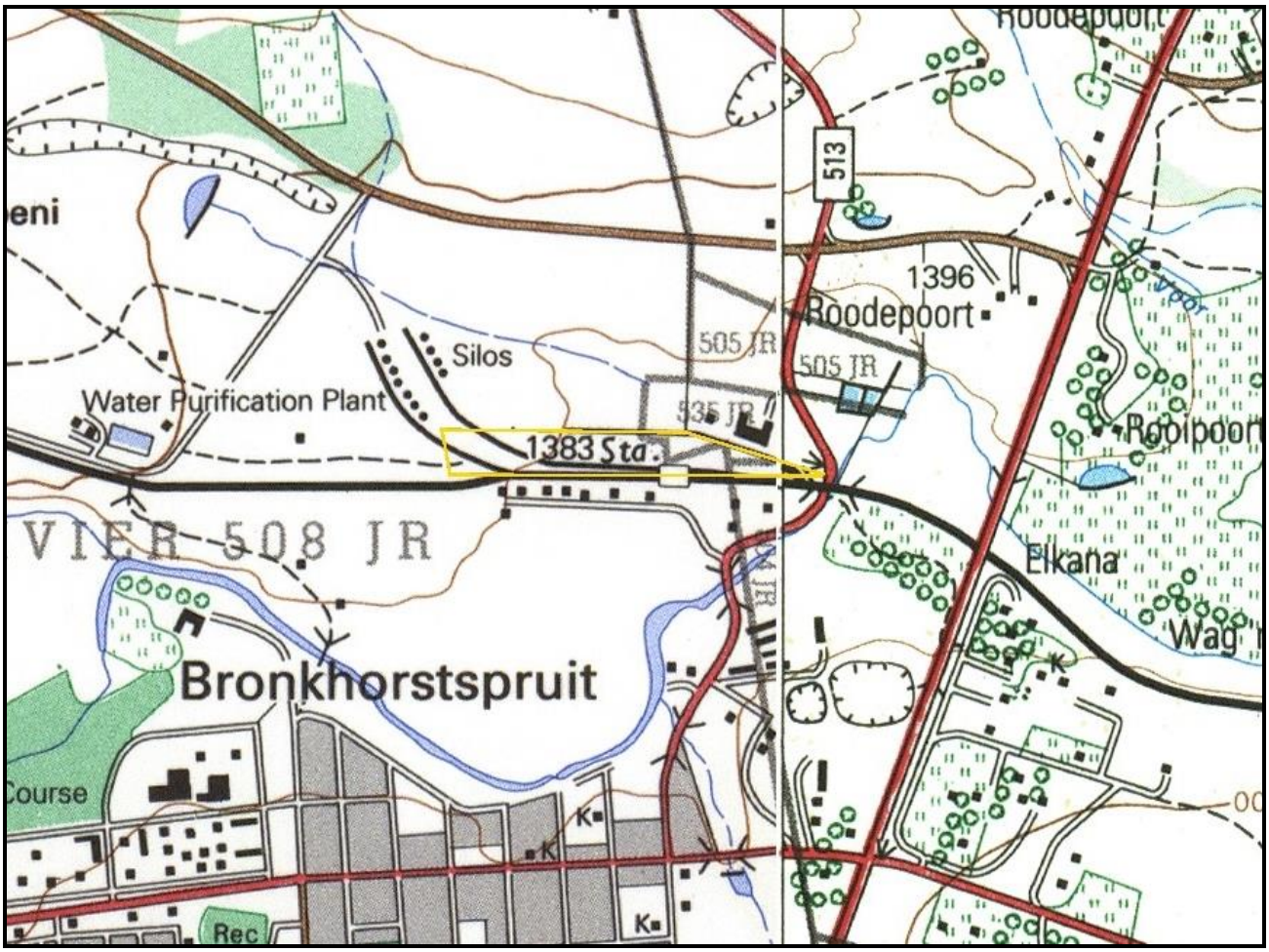


Figure 7. 1995 Topographical map of the area under investigation. The Bronkhorstspruit train station, the railway and two secondary roads can be seen within the study area. No buildings are present within this area. To the northwest, silos have been constructed along two secondary roads. (Topographical Map 1995; Topographical Map 1995)

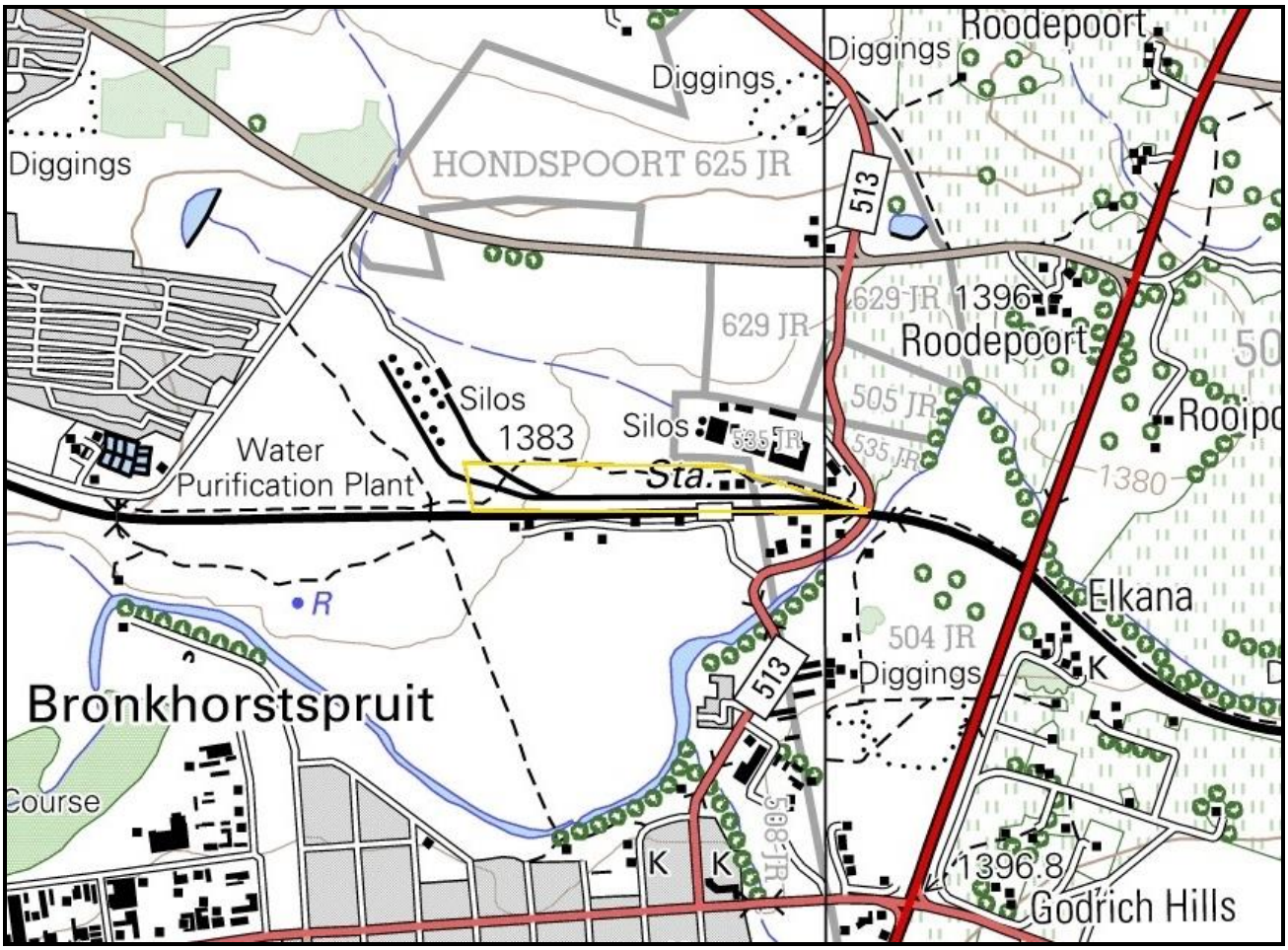


Figure 8. 2003 Topographical map of the area under investigation. Developments in the study area include the railway, the Bronkhorstspruit Railway Station, a dirt road, secondary roads and two buildings. Silos are visible to the north and northwest of the study area, and a Water Purification Plant had been constructed further to the west. (Topographical Map 2003; Topographical Map 2003)

4.2.3. A brief history of human settlement in the Bronkhorstspruit area

Long before European settlers moved inland, Stone Age and Iron Age communities had left their mark on the old Transvaal landscape. It was only by the late 1830s that a mass-movement of Dutch speaking people in the Cape Colony started advancing into the northern areas. This was due to feelings of mounting dissatisfaction caused by economical and other circumstances under British rule in the Cape. This movement later became known as the Great Trek. This migration resulted in a massive increase in the extent of that proportion of modern South Africa dominated by people of European descent. (Ross 2002: 39)

The movement of whites into the interior would have a significant impact on the black people who populated the land. This was also the case in the area where the farm under investigation is located. Farms were surveyed in a large area, which included the present-day Bronkhorstspruit area, between 1839 and 1840. By 1860, the population of whites in the central Transvaal was already very dense and the administrative machinery of their leaders was firmly in place. Many of the policies that would later be entrenched as legislation during the period of apartheid had already been developed. (Bergh 1999: 15, 170)

An important conflict took place at Bronkhorstspruit during the First Anglo-Boer War in December 1880. This event will now be discussed in some detail.

4.2.3.1.The First War Of Independence, 1880-1881 – The 'Battle' Of Bronkhorstspruit (20 December 1880)

Background

The final British annexation of the Cape in 1806 marked the beginning of a strong rift between the inhabitants of the Cape who were mainly from Dutch, French and later German descent and the new British Cape Colonial government. The community at the Cape and the cattle farmers further north east, towards Port Elizabeth, Grahamstown and Colesberg had developed a unique African character and a strong sense of independence and self-rule. When this was threatened by the Colonial Government they chose to move into the interior of South Africa in pursuit of their own, independent republic. Eventually two Boer Republics then known as the Transvaal Republic and the Republic of the Orange Free State were established. They first obtained independence from Britain in 1852 after the Sand River Convention and for nearly 30 years the Boers led a mainly agrarian existence. (Duxbury 1981: 1-8)

Causes of the war:

The two Boer republics were however in the way of Britain's plans for a confederation of the states in Southern Africa and in 1877 they annexed the Transvaal. The Boers regarded this as a direct violation of the Sand River Convention and a threat to their hard earned independence and many protest meetings were held across this Republic. In the three years after annexation, the British failed to acknowledge the smouldering discontent and when the authorities began to clamp down on non-payment of taxes, it sparked the first uprising of many in the small town of Potchefstroom in the then western Transvaal in December 1880. This marked the outbreak of what later became known as the First War of Independence or the Transvaal War. As early as November, however, British Forces were ordered to Pretoria as the hostile attitude of the Boers became more imminent. Other forces were stationed at Rustenburg, Lydenburg, Marabastad, Wakkerstroom and Standerton. (Duxbury 1981: 1-8)

Bronkhorstspruit:

British forces, (the 94th Regiment) stationed at Lydenburg received orders to move to Pretoria and reached Middelburg on 15 December. Boer movements and gatherings were noticed and the column under command of Lt. Col. Anstruther moved its wagons in laager style every night as a precautionary matter. On 20 December the column reached a small stream called the Bronkhorstspruit. It was then that a party of 150 Boers were noticed on a nearby ridge. The column stopped and a Boer messenger delivered a note to Anstruther giving him two minutes to answer. Meanwhile the Boers under command of Commandant Frans Joubert grew in numbers and moved closer. There was no way that Anstruther would negotiate as he had orders to obey. There is ambiguity as to what happened next, but fire was opened which lasted for about 15 minutes. (Duxbury 1981: 9-18)

Although accurate figures are not available, names on monuments indicate that the British suffered 78 killed, 79 wounded and several prisoners of war taken. Anstruther died of wounds six days later. On Boer side one was killed in action, one died of wounds and five were wounded. (Duxbury 1981: 9-18)

Figure 9. The British Monument outside Bronkhorstspruit.

Photograph: C Kruger, Heritage Foundation

Joubert allowed for the establishment of a camp for the wounded and for 20 men to assist in the burying of the dead and caring for the wounded. The remainder were taken prisoner. (Duxbury 1981: 9-18)

Figure 10. The Boer Monument, Bronkhorstspruit.

Photograph: C Kruger, Heritage Foundation

After the Bronkhorstspruit incident the Boers besieged British garrisons at Lydenburg, Rustenburg, Standerton and Wakkerstroom. This was followed by the three major defeats of the British at Laingsnek, Schuinshoogte and eventually, Majuba. (Duxbury 1981: 17-44)

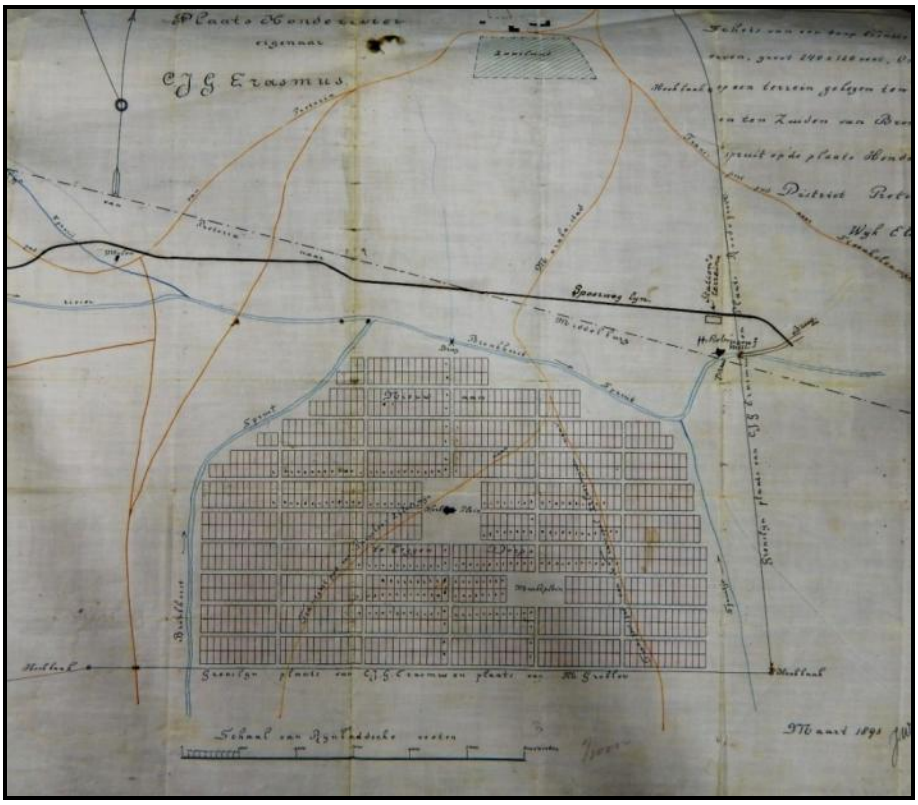
4.2.3.2.The Twentieth Century

The Anglo-Boer War, which took place between 1899 and 1902 in South Africa, was one of the most turbulent times in South Africa's history. Even before the outbreak of war in October 1899 British politicians, including Sir Alfred Milner and Chamberlain, had declared that should Britain's differences with the South African Republic result in violence, it would mean the end of republican independence. This decision was not immediately publicized, and as a consequence republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was, however, a clear statement of British war aims. (Du Preez 1977)

A black concentration camp was located next to the railway station at Bronkhorstspruit during the Anglo-Boer War. One of the conflicts of the war also took place a small distance to the southeast of the town. The battalion of B. Viljoen attacked that of the British commander Garrison on 18 November 1900. (Bergh 1999: 15)

Figure 11. Historical aerial photograph of Bronkhorstspruit with the Dutch Reformed Church in the forefront. (Anon 1949)

Today, Bronkhorstspruit is a small town 50 kilometers east of Pretoria in Gauteng, South Africa, along the N4 highway towards Witbank. It lies on the border between the Gauteng and Mpumalanga Provinces. Before the establishment of the town, in 1858, a group of Voortrekkers settled in the Bronkhorstspruit creek, which was originally called Kalkoenkransrivier. A railway station was established on the present-day site of Bronkhorstspruit in 1894. In June 1897, the South African Republic gave its approval for the establishment of the town, by that time already named Bronkhorstspruit by locals. It was however only in 1905 that Bronkhorstspruit, also referred to as Erasmus, was officially proclaimed as a town. There is disagreement about how the town originally got its name. Some say that it was named after the farmer J. G. Bronkhorst, whereas others believe that it was named after the plant *bronkors* (the Afrikaans name for watercress), that grew in the region of the creek. (Internet Archive N/d; Routes 2013)



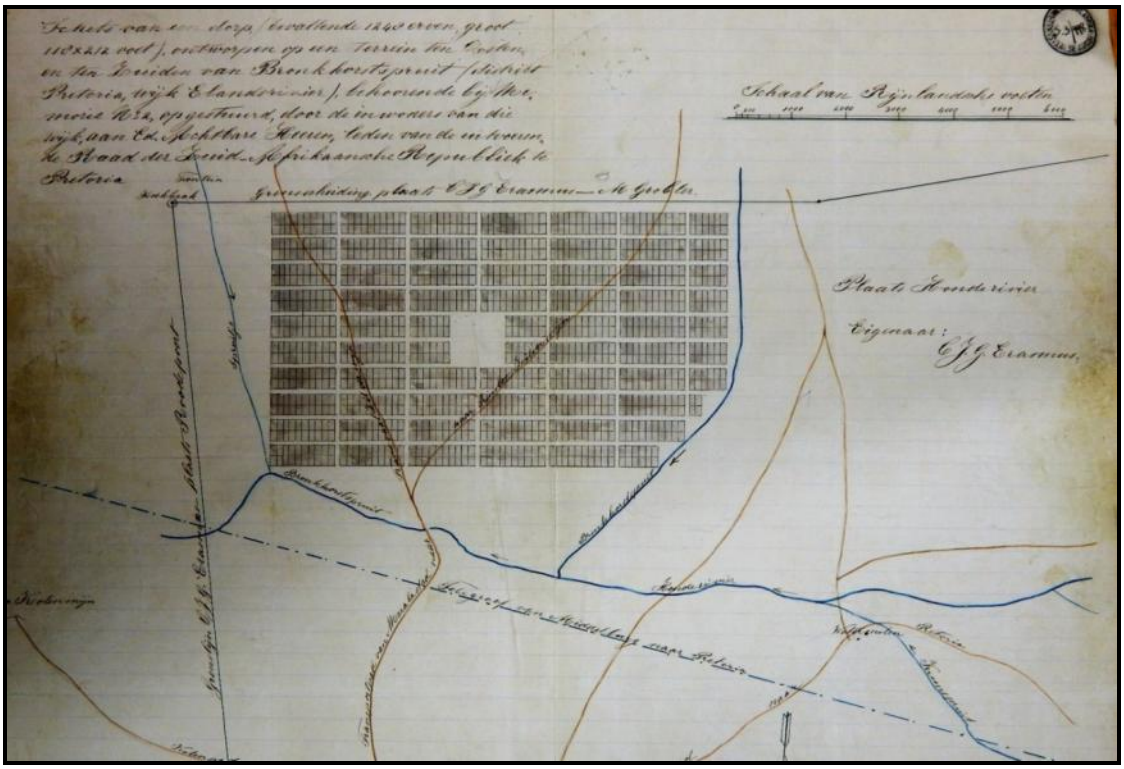


Figure 12. Two 1891 Maps with designs for the town Bronkhorstspruit. (NASA Maps: S3/964; NASA Maps: S3/998)

4.3. Historical overview of the ownership and development of the study area

Issues of special interest in this study are the history of land ownership, as well as historical land use and the structures it left behind on the property.

Record of historical owners:

The farm known as Hondsrivier 361 was first inspected on 22 December 1860 by D. J. Erasmus and was originally 3453 morgen in extent. The farm was granted to Hendrik Jacobus Prinsloo by Government Transport on 6 March 1862. It was located in the Elandsrivier ward. (NASA RAK *2898*; NASA RAK *2991*)

Date of Transport	Portion	Landowner	New Landowner	Price
1873/01/25	Southern ½ of farm	Hendrik Jacobus Prinsloo	Cornelis Johannes Gerhardus Erasmus	£112
1874/04/27	Northern ½ of farm	Hendrik Jacobus Prinsloo	Cornelis Johannes Gerhardus Erasmus	£300
1906/03/12	Whole farm	Certificate of Reg Title used in lieu of Transfer in favour of	Cornelis Johannes Gerhardus Erasmus	-
1906/10/05	Portion in extent 1 morgen 473 sq rds	Cornelis Johannes Gerhardus Erasmus	Gereformeerde Gemeente, Erasmus	£100
1906/10/17	Portion in extent 1 morgen 473 sq rds	Cornelis Johannes Gerhardus Erasmus	Nederduitsch Hervormde Gemeente, Erasmus	£100
1907	Portion in extent 1 morgen 473 sq rds	Cornelis Johannes Gerhardus Erasmus	Nederduitsch Hervormde Gemeente, Pretoria	£100
1909/10/13	Portion in extent 101 morgen	C. H. Erasmus (born Erasmus), Estate of late C. J. G. Erasmus	The Government of the Transvaal	-
1909/10/13	Portion in extent 2 morgen 230 sq rds	C. E. Erasmus (born Erasmus), Estate of late C. J. G. Erasmus	The Government of the Transvaal (Reserved for educational purposes)	-
1910/08/06	RE of farm in extent 3164 morgen 227 sq rds (exclusive of townships Erasmus)	Catharina E. Erasmus, Estate of C. J. G. Erasmus	Catharina Elizabeth Erasmus (born Erasmus), widow	-
1913/05/16	Portion in extent 1 morgen 473 sq rds	Ned. Hervormde Gemeente, Pretoria	Ned. Hervormde Gemeente, Erasmus	-
1913/07/26	Portion in extent 1	Certificate of Title	Ned. Hervormde Gemeente,	-

	morgen 473 sq rds		Erasmus	
1917/08/24	Portion in extent 1 morgen 473 sq rds	Certificate of Title	Ned. Hervormde Gemeente, Erasmus	-
1917/08/24	Portion in extent 1 morgen 473 sq rds	Ned. Hervormde Gemeente, Erasmus	Harry Carver Godrich	£100
1918/02/04	Portion in extent 1 morgen 473 sq rds	H. C. Godrich	Haman Abram Behr & Adolf Behr trading as Behr Brothers	£39
1937	Certain portion	-	H. P. Prinsloo	-
1940	Certain portion	-	J. L. R. Erasmus and 4 others	Grant
1960	Certain portion (farm was known as Hondrivier 508 JR at the time)	-	L. P. Greyling	-
1969	Portion of Portion 25	Jacobus Johannes Steyn	-	-

(NASA TAB RAK *2898*; NASA TAB RAK *2991;* NASA *SAB, URU: 1653 1543;* NASA *SAB, URU: 1886 1936;* NASA *SAB, URU: 4131 3080;* NASA *SAB, CDB: 7167 PB4/2/2/2359 [Vol 2]*)

* *Note that some of the registers at the National Archives are missing. Therefore this record is not entirely complete. All available documents were used to draw up this table.*

Notably, it seems that the Erasmus family had a strong presence in the Bronkhorstspruit area, and this is possibly why the town was often referred to as “Erasmus”.

A search on the Windeed online database has revealed that the Remaining Extent (RE) of Portion 24 and the RE of Portion 25 (which form part of the area under investigation), are currently owned by Transnet Ltd, which acquired the properties on 21 August 1975 and 4 July 1975, respectively. These properties are currently under the local authority of the Kungwini Local Municipality. No information regarding historic landowners could be provided. (Windeed 2016)

History of land use

The earliest record found regarding the farm Hondsrivier was a 1922 government notice concerning the reservation of certain erven in the township of Erasmus for government purposes. The grant to the Village Council of Erasmus of certain erven, as well as a portion of the farm Hondsrivier 361, was also approved. This land would make up the town lands of the Erasmus Township. (NASA *SAB, URU: 559 1006*)

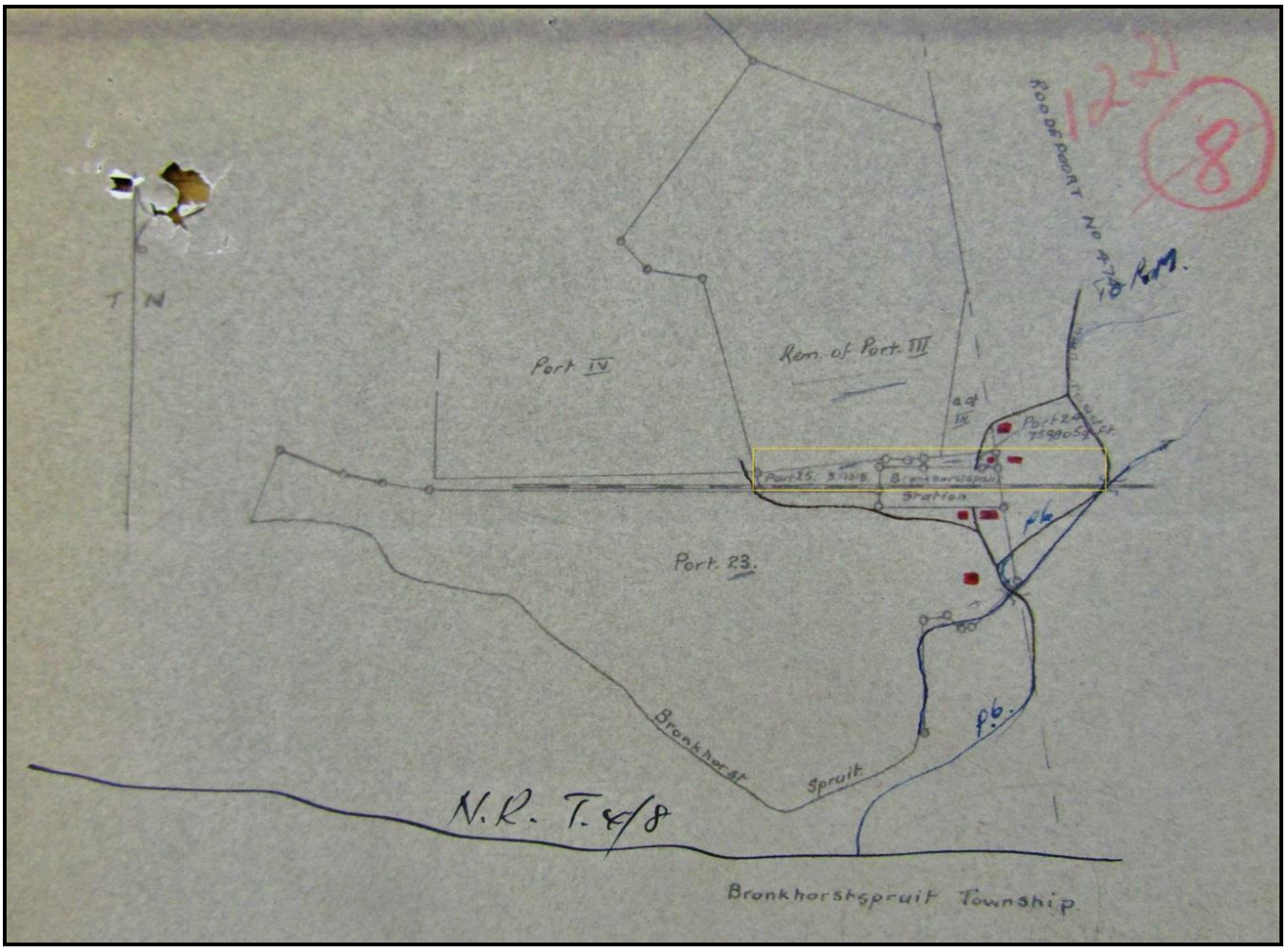


Figure 13.Sketch plan showing Portions 23, 24, 25 and the Remaining Extent of Portion III of Hondsrivier 361, district Pretoria. The area within the yellow border, comprised of Portion 24 and 25 of Hondsrivier 361 as well as the Bronkhorstspruit Train Station, forms part of the area under investigation. (NASA *SAB, CDB: 3/669 TAD9/18 [Volume 1]*)

In December 1942, the process was underway to subdivide Portions 23, 24 and 25 of Hondsrivier 361. The Surveyor-General recommended that this subdivision would be approved. He further recommended that Portions 23 and 24 would be transferred to the same party and that these two portions would be "tied on" so that they could not be dealt with separately. In the same way, he recommended that Portion 25 would be transferred to the owner of the RE of Portion III and that these two properties would also be tied together. By October 1943 the Surveyor-General however recommended against the condition of the "tying on" of properties, since the owners of the properties were effecting the subdivision for partition purposes and one of the parties would not agree to restrictive conditions. The subdivision, minus the restrictive conditions, was approved by the Provincial Secretary in December 1943. (NASA *SAB, CDB: 3/669 TAD9/18 [Volume 1]*)

By 1943, Portions 24 and 25 were traversed by a small branch road. (NASA *SAB, CDB: 3/669 TAD9/18 [Volume 1]*)

By the early 1950s, the farm under investigation was known as Hondsrivier 189 and made up part of the town Erasmus. The portions under investigation were located to the northeast of the township. By the early 1960s the town of Erasmus was also referred to as Bronkhorstspruit. (NASA *SAB, CDB: 3/468 TAD6/14;* NASA *SAB, CDB: 7167 PB4/2/2/2359 [Vol 1]*)

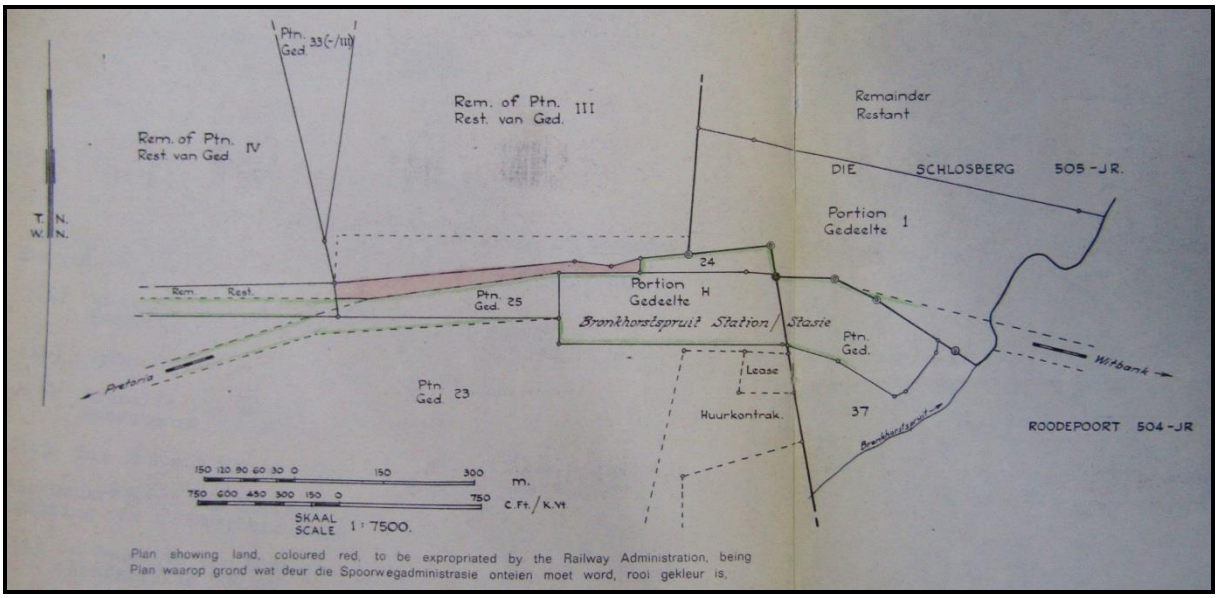


Figure 14. 1969 Map showing the area where the railway line from Witbank to Pretoria intersects the Bronkhorstspruit area. The area coloured red on the map, known as a portion of Portion 25 of Hondsrivier 508 JR, was to be expropriated by the Railway Administration and used as a loading site. The land was owned by Jacobus Johannes Steyn at the time. This portion was 1.29 morgen in extent. (NASA *SAB, CDB: 7167 PB4/2/2/2359 [Vol 2]*)

In 1969, a portion of land on Hondsrivier 508 JR was earmarked to be expropriated by the Railway Administration, being a part of Portion 25 of the farm. Portion H was used as the Bronkhorstspruit Railway Station. These portions as well as Portion 24 formed part of the area under investigation. (NASA *SAB, CDB: 7167 PB4/2/2/2359 [Vol 2]*)

In November 1970, Jacobus Johannes Steyn sold a number of his properties to Bronkhorstspruit Industriele Beleggings (Eiendoms) Beperk. This included the following: Portion 25, 26 and the Remaining Extent of Portion III of Hondsrivier 508 JR, the RE of Die Schlosberg 505 JR and Portion 84 of Roodepoort 504 JR. This was done in order for the Bronkhorstspruit Industrial Town to officially come into being. (NASA *SAB, CDB: 7167 PB4/2/2/2359 [Vol 1]*)

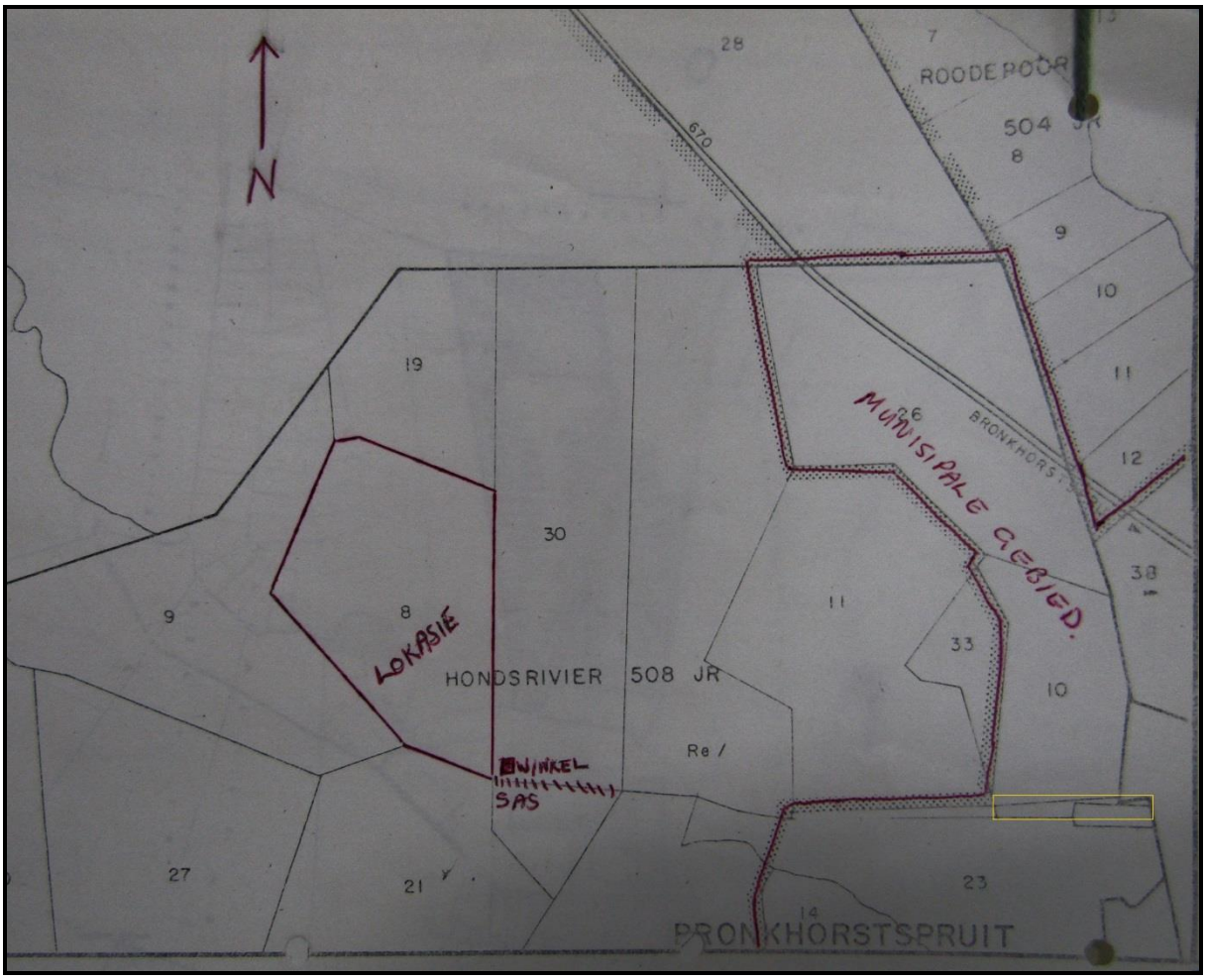


Figure 15. Early 1980s map of the Bronkhorstspruit area, showing how the farm Hondsrivier 508 JR was subdivided, as well as where the location and Municipal area were located. The area under investigation is indicated with a yellow border. (NASA *SAB, BAO: 3/2846 A7/6/2/B78/1*)

5. HERITAGE SITE SIGNIFICANCE AND MITIGATION MEASURES

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed project the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface.

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposits;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined/is known);
- The preservation condition of the sites;
- Potential to answer present research questions.

Furthermore, The National Heritage Resources Act (Act No 25 of 1999, Sec 3) distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to the community, or pattern of South Africa's history;
- Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- Sites of significance relating to the history of slavery in South Africa.

5.1. Field Rating of Sites

Site significance classification standards prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 7 of this report.

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

5.2. Impact Assessment Methodology

The following impact assessment methodology was provided by the client.

The significance of the impacts is determined through a synthesis of these criteria, ranking them as follows;

Risk classification

Significance Rating (SR)	**Significance**
350 - 600	Very high
200 – 349	High
149 - 199	Medium
0 – 149	Low

For each impact identified, the Significance Rating (SR) is determined by various factors. Significance is described prior to mitigation as well as with the most effective mitigation measure(s) in place where so required.

The significant Rating is calculated as follows;

Risk (SR) = (Exposure + Probability + Magnitude) x Severity – (Mitigation + Degree to which the impact can be reversed)

The criteria are defined as follows;

- **Duration** – Refers to timeframe of the impact (how long will it last)
- **Probability** – Refers to the likeliness (chance) of the event occurring
- **Extent** – Refers to the scale of the impact in case the aspect results into impact (how far will the impact reach)
- **Severity** – Refers to the degree to which the impacts can change the environment
- **Mitigation** – Refers to a control that can be implemented to reduce the significance of an environmental impact
- **Degree to which the impact can be reversed** – refers to the chance that the impact can be reversed by applying mitigation measures

A risk rating value is assigned accordingly as follows;

Table 1: Marks awarded for duration:

Duration	Guidelines	Value
Permanent	Permanent	10
Long term	As long as the facility is in operation	7
Medium term	5-10 years	5
Short term	0-4 years	3

Table 2: Marks awarded for probability:

Probability	Guidelines	Value
Definite	where the impact will occur regardless of any prevention measures impact is likely to occur 11 – 15 times per year	10
Highly probable	where it is most likely that the impact will occur (>70% and <90% sure)	8
Probable	it is probable that the impact will occur 5 to 10 times per year where there is a distinct possibility that the impact will occur (>40% and < 70% sure); impact occurs very rarely (less than 5 times) throughout the year	6
Improbable	where the possibility of the impact to materialise is very low, either because of design or historic experience (<40% sure)	3
Imposable	No risk	0

Table 3: Marks awarded for extent

Extent	Guidelines	Value
International	Causes international impacts	10
National	Where the impact would have an impact on a national scale	9
Regional	Where the impact would extend to the region (municipal boundaries);	7
Local	Where the impact would be limited to the site and its immediate surroundings;	5
Immediate	extending only as far as the activity	3

Table 4: Marks awarded for severity

Severity	Guidelines	Value
Highly significant	Causes irreparable damage	20
Severe	where natural or social functions or processes are altered to the extent that they will temporarily or permanently cease.	15
Major	where the affected environment is altered but natural and social functions and processes continue albeit in a modified way;	10
Minor	where the impact affects the environment in such a way that the natural and social functions and processes are affected in an insignificant manner. The impact is of low order and therefore likely to have little real effect	5

Table 5: Marks awarded for mitigation

Mitigation	Guidelines	Value
Engineering controls	an engineering control such as bund walls or lock out valves to control the activity	-10%
Administrative	Procedure or work instruction that guides or manage the activity	- 5%

Degree to which the impact can be reversed	Guidelines	Value
High	The impact can be reversed easily by applying little effort	- 8%
Medium	The impact can be reversed by applying effective mitigation measures	- 6%
Low	The chance of reversing the impact is low and is not likely. However, by applying extensive measures the impact can be reversed	- 4%
None	Cannot be reversed	- 0%

Any potential impact with a Risk Rating (SR) “medium risk” or higher must be assigned a mitigation measure to mitigate impact. In this case, most of the impacts have been determined as a low or medium impact, mitigation measures were however still assigned from a responsible corporate citizen and precautionary approach principal.

The mitigation described in the Environmental Management Programme (EMPr) document, represents the full range of plausible and pragmatic measures but does not necessarily imply that they all should or will be implemented. The decision as to which mitigation measures to implement lies with the applicant and ultimately with the relevant competent authority.

6. BASELINE STUDY-DESCRIPTION OF SITES

It is important to note that the entire farm was not surveyed but only the development footprint. The landscape in the study area is entirely altered by developments relating to the existing railway siding, therefore archaeological visibility is low (Figure 16 - 19). Inside the study area two standing buildings occur consisting of a large storage space (Feature 1) at 25° 47' 39.0263" S, 28° 44' 49.8245" E and the ruins of bathrooms (Feature 2) at 25° 47' 38.9351" S, 28° 44' 52.4420" E (Figure 20). From archival maps it is indicated that all buildings were demolished prior to 1995 and therefor the age of the existing structures in the study area is not estimated to be older than 60 years, assuming that the 1995 mapping is accurate.

The study area is characterised by historical railway lines some dating to 1951 (Figure 21) and powerline pylons (Figure 17) that form part of the same landscape as the 1951 railway lines (Figure 16 and 17). No traces of any archaeological remains were identified during the survey, a search on archaeological data bases also yielded no known sites within the study area and no archaeological significant sites were identified during the desktop study. Several studies in the immediate vicinity of the study area also did not record any archaeological sites of significance (e.g. Coetzee 2008, Van der Walt 2008 and Kusel 2009). The area is characterised by railway and industrial developments and no significant cultural landscapes or viewscapes were noted during the fieldwork.

Figure 16: Study area viewed from the south east.

Figure 17. Study area viewed from the west with historical pylons visible.

Figure 18. Study area viewed from the west.

Figure 19. Study area viewed from the north.

Figure 20. Google Image of the study area showing features in the study area.

Figure 21: Stamp on the railway indicating an approximate date of 1951 for the railway lines.

Figure 22. Large storage space.

Figure 23. Ruin of bathrooms.

6.1. Impact Assessment

Due to the non-renewable nature of heritage resources, it is important to keep in mind that impacts are always permanent and irreversible.

As per the impact assessment methodology that was provided, the railway line and historical power pylons that are protected by the NHRA are rated as follows:

Risk (SR) = (Exposure (10) + Probability (10) + Magnitude (5)) x Severity (5) – (Mitigation (5%) + Degree to which the impact can be reversed (0%))

- **Duration** – Impact to heritage resources is always permanent (10)
- **Probability** – The features will be destroyed (10)
- **Extent** – Local (5)
- **Severity** – Minor (5) (these features are of low heritage significance as several hundred km of the same railway track is preserved in the wider landscape)
- **Mitigation** – Application for a destruction permit and recording of the features as done in this report (-5%).
- **Degree to which the impact can be reversed** – Impacts to heritage resources cannot be reversed (0%)

SR = 118.75 – Low

Please see section 7 for recommendations regarding the heritage resources.

7. CONCLUSIONS AND RECOMMENDATIONS

HCAC was appointed to assess the study area in terms of the archaeological component of Section 35 of the NHRA. The study area has been transformed by the existing railway siding and no raw material suitable for stone tool manufacture occurs in the study area and no ceramics or stone walls attributed to the Iron Age were recorded within the study area. No further mitigation is recommended in terms of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), two standing structures occur in the study area. Based on archival maps these structures are not older than 60 years or of architectural significance. In addition to the buildings the existing railway lines and historical power pylons also occur within the study area. The railway line and historical power pylons are protected by the NHRA under the 60 year clause. Although these features are of low heritage significance as several hundred km of the same railway track is preserved in the wider landscape, it is recommended that the developer should apply for a destruction permit of these features from the SAHRA prior to development as these features are subject to the Act.

In terms of Section 36 of the Act no burial sites were recorded. However if any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation.

From the archival study it was highlighted that a black concentration camp was located next to the railway station at Bronkhorstspruit during the Anglo-Boer War (1901). The exact location of the camp is unknown and is possibly located outside of the development footprint and during the survey no visible remains of the concentration camp were identified. If the camp is located within the study area below the existing surface infrastructure it is recommended that a chance find procedure is implemented for the project as part of the EMP that would also address subsurface archaeological remains and graves:

Chance find procedure

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.

- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.

- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

The study area is surrounded by residential developments and no significant cultural landscapes or viewscapes were noted during the fieldwork.

7.1 Reasoned Opinion

From a heritage perspective the proposed project is acceptable from a heritage point of view. If the above recommendations are adhered to and based on approval from SAHRA, HCAC is of the opinion that the development can continue as the development will not impact negatively on the archaeological record of the area. If during the pre-construction phase or during construction, any archaeological finds are made (e.g. graves, stone tools, and skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds. Due to the subsurface nature of archaeological material and graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded, but can be easily mitigated by preserving the sites *in-situ* within the development.

8. PROJECT TEAM

Jaco van der Walt, Project Manager

9. STATEMENT OF COMPETENCY

I (Jaco van der Walt) am a member of ASAPA (no 159), and accredited in the following fields of the CRM Section of the association: Iron Age Archaeology, Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation. This accreditation is also acknowledged by SAHRA and AMAFA.

I have been involved in research and contract work in South Africa, Botswana, Zimbabwe, Mozambique, Tanzania and the DRC; having conducted more than 300 AIA's since 2000.

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