HERITAGE IMPACT ASSESSMENT

(REQUIRED UNDER SECTION 38(8) OF THE NHRA (No. 25 OF 1999)

FOR THE ESTABLISHMENT OF VARIOUS PROJECTS AND THE EXPANSION OF THE EXPLORATION PROGRAMME AT DWARSRIVIER CHROME MINE, STEELPOORT, LIMPOPO PROVINCE

Type of development:

Mining development

Client:

Dwarsrivier Chrome Mine (Pty) Ltd

Client info:

Tanja Bekker – Envirogistics

E – mail: tanja@envirogistics.co.za

Developer: Dwarsrivier Chrome Mine (Pty) Ltd

HCAC - Heritage Consultants

Private Bag X 1049

Suite 34

Modimolle

0510

Tel: 082 373 8491

Fax: 086 691 6461

E-Mail: jaco.heritage@gmail.com

Report Author:

Mr. J. van der Walt

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APPROVAL PAGE

Project Name	Dwarsrivier Chrome Mine
Report Title	Heritage Impact Assessment for the establishment of various projects and the expansion of the exploration programme at Dwarsrivier Chrome Mine, Steelpoort, Limpopo Province
Authority Reference Number	TBC
Report Status	Final Draft Report
Applicant Name	Dwarsrivier Chrome Mine (Pty) Ltd

	Name	Signature	Qualifications and Certifications	Date
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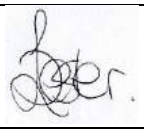
	Liesl Bester		BHCS Honours	July 2018

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Date	Report Reference Number	Description of Amendment

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REPORT OUTLINE

Appendix 6 of the GNR 326 EIA Regulations published on 7 April 2017 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 1. Specialist Report Requirements.

Requirement from Appendix 6 of GN 326 EIA Regulation 2017	Chapter
(a) Details of - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Section a Section 12
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	*Declaration of Independence*
(c) Indication of the scope of, and the purpose for which, the report was prepared	Section 1
(cA)an indication of the quality and age of base data used for the specialist report	Section 3.4 and 7.1.
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	9
(d) Duration, Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.4
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 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;	Section 8 and 9
(g) Identification of any areas to be avoided, including buffers	Section 8 and 9
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 8
(I) Description of any assumptions made and any uncertainties or gaps in knowledge	Section 3.7
(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;	Section 9
(k) Mitigation measures for inclusion in the EMPr	Section 9
(I) Conditions for inclusion in the environmental authorisation	Section 9
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9
(n) Reasoned opinion - (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (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	Section 9.2
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Section 6
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer to EIA report
(q) Any other information requested by the competent authority	Section 10

Executive Summary

Envirogistics is conducting an Environmental Impact Assessment for the Dwarsrivier Chrome Mine (Pty) Ltd for the establishment of the following projects:

Component	Description	Size of impact	Location
Project 1	Expansion of the exploration programme	14 ha (Drill pads) 25 ha (roads)	The exploration activities are planned over the Dwarsrivier Mine Mining Rights, however, this will extend onto the Two Rivers Platinum Surface Rights,
Project 2	Capital Projects	Approximately 20 hectares	Dwarsrivier Mining Right area
Project 3	Diesel Storage	Approximately 12 hectares	Dwarsrivier Mining Right area
Project 4	Water Discharge	0.0045ha (45m2)	Dwarsrivier Mining Right area

The project area is situated approximately 60km northwest of Lydenburg, 25km south of Steelpoort and 63km northeast of Roossenekal in the Limpopo Province. The mine is located in the Fetakgomo-Greater Tubatse Local Municipality, within the boundaries of the Sekhukhune District Municipality.

HCAC was appointed to conduct a Heritage Impact Assessment for the proposed expansion activities to determine the presence of cultural heritage sites and the impact of the proposed development on these non-renewable resources. The study areas were assessed both on desktop level and by a non-intrusive pedestrian survey. From the desktop study it became clear that the archaeology of the wider region has been recorded through several CRM projects in the area (e.g. Van Vollenhoven & Pelser 2001 and 2002; Van der Walt 2017 and 2018) and ranges from the Middle Stone Age (MSA) to the recent households of farm labourers. Their distributions on the landscape show different land use patterns. Many agriculturally-orientated societies (making *Eiland, Leolo* and *Marateng* pottery) built their villages in the valleys near cultivatable alluvium. Others (probably Ndebele) built terraced-settlements on basal slopes of the valley edge, while farm labourers usually lived in the valleys as well. During the 19th Century, farmers lived around the edge of high meadows as a measure of protection. A few Middle Iron Age *Eiland* sites were also cited in this plateau environment (Huffman & Van der Walt 2012).

Large portions of the study area are characterised by existing mining operations that would have impacted on surface indicators of heritage sites and apart from isolated widely scattered MSA artefacts (of low significance) no archaeological sites of significance were recorded during the survey for the Capital projects and Diesel Storage. In terms of the exploration programme two Iron Age sites were recorded by Stegman & Roodt (2012), these areas should be avoided with a 50-meter buffer zone around the sites.

The study area is indicated as of low to insignificant palaeontological sensitivity on the SAHRA palaeontological map. This is corroborated by a paleontological study (Rossouw 2017) that found that the Dwarsrivier mine area is underlain by paleontologically insignificant intrusive igneous rocks and there is little chance of finding fossil material. The well-known geological monument referred to as the “Dwarsrivier National Monument” is located close to some of the drill pads and will have to be preserved with a buffer zone of 100 meters. No further mitigation prior to construction is recommended in terms of the archaeological and paleontological components of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the impact areas for the Capital Projects and Diesel Storage (including decommissioning of existing facilities). Several buildings were however identified from the desktop study close to drill pads and should be avoided with a 30-meter buffer zone. In terms of Section 36 of the Act several burial sites are known to exist in the larger project area. However no burial sites are on record for the areas of impact. If any graves

are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. The area is extensively mined and the proposed project is in line with the current land use and will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised.

Sources of risk were identified that may impact on heritage resources (Table 2). These risks will be primarily associated with clearing of vegetation and topsoil. These risks and associated impacts may be avoided and minimised with the correct mitigation measures in place as summarised below.

Table 2. Possible heritage impacts and mitigation measures.

Component	Proposed Activity	Possible Heritage Impacts	Mitigation Measures
Project 1	Farm Dwarsrivier 372KT Portion 0: Exploration Drilling (access roads and approximately 25 drill pads)	Direct impacts to previously unknown Iron Age Sites.	• Development of a Heritage management plan • Implementation of a Chance find procedure during construction
Project 1	Farm Dwarsrivier 372KT Remainder of Portion 1: Exploration Drilling (access roads and approximately 30 drill pads)	Direct impacts to previously unknown Iron Age Sites. Indirect impacts to built environment (Site Dwarsrivier 2).	• Development of a Heritage management plan • Implementation of a Chance find procedure during construction
Project 1	Farm Dwarsrivier 372KT Remainder of Portion 6: Exploration Drilling (access roads and approximately 250 drill pads)	Direct impacts to Iron Age sites especially Sites SIA 1 & 2. Indirect impacts to built environment (Sites Sarashof & Dwarsrivier 1).	• The known Iron Age sites should be avoided with a 50-meter buffer zone • The structures should be avoided with a 30-meter buffer zone • Development of a Heritage management plan • Implementation of a Chance find procedure during construction
Project 1	Farm Dwarsrivier 372KT Remainder of Portion 7: Exploration Drilling (access roads and approximately 40 drill pads)	Direct impacts to unknown Iron Age Sites. Indirect impacts to Grave sites especially Sites 01-3 & 01-10.	• Known graves should be indicated on development plans and avoided. • Development of a Heritage management plan • Implementation of a Chance find procedure during construction
Project 2	Capital Projects - Low Grade Product Stockpiles	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 2	Capital Projects - North Shaft Infrastructure	No Heritage impact	• No Mitigation required prior to construction

			• Chance find procedure during construction
Project 2	Capital Projects - Truck Parking Area	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 2	Capital Projects - South Mine Laydown Area	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 2	Capital Projects - Treated Water Reservoir	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 2	Capital Projects - Security Office Upgrades	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 2	Capital Projects - Topsoil Stockpile Expansion	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 3	Diesel Storage	No Heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction
Project 4	Discharge of Water	No heritage impact	• No Mitigation required prior to construction • Chance find procedure during construction

The impact of the proposed project on heritage resources can be mitigated and it is recommended that the proposed project can commence on the condition that the recommendations made in this report is implemented as part of the EMPr and based on approval from SAHRA.

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Declaration of Independence

Specialist Name	Jaco van der Walt
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that I: • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, 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 form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	3/07/2018

a) Expertise of the specialist

Jaco van der Walt has been practising as a CRM archaeologist for 15 years. He obtained an MA degree in Archaeology from the University of the Witwatersrand focussing on the Iron Age in 2012 and is a PhD candidate at the University of Johannesburg focussing on Stone Age Archaeology with specific interest in the Middle Stone Age (MSA) and Later Stone Age (LSA). Jaco is an accredited member of ASAPA (#159) and have conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, KZN as well as he Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, DRC Zambia and Tanzania. Through this he has a sound understanding of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BGG Burial Ground and Graves
BIA: Basic Impact Assessment
CFPs: Chance Find Procedures
CMP: Conservation Management Plan
CRR: Comments and Response Report
CRM: Cultural Resource Management
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Programme
ESA: Early Stone Age
ESIA: Environmental and Social Impact Assessment
GIS Geographical Information System
GPS: Global Positioning System
GRP Grave Relocation Plan
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, 1998 (Act No. 107 of 1998)
NHRA National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID Notification of Intent to Develop
NoK Next-of-Kin
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 Introduction and Terms of Reference:

Heritage Contracts and Archaeological Consulting CC (**HCAC)** has been contracted by Envirogistics to conduct a heritage impact assessment of the proposed expansion of the Dwarsrivier Mine. The report forms part of the Environmental Impact Assessment Report (EIA) and Environmental Management Programme Report (EMPR) for the development.

The aim of the study is to survey the proposed development footprint 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 No 25 of 1999). The report outlines the approach and methodology utilized before and during the survey, which includes: Phase 1, review of relevant literature; Phase 2, the physical surveying of the area on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey, a national monument and isolated MSA material was identified. Based on previous reports for the Two Rivers Mine several Iron Age sites, ruins and graves are on record. General site conditions and features on sites were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report. SAHRA as a commenting authority under section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) require all environmental documents, complied in support of an Environmental Authorisation application as defined by NEMA EIA Regulations section 40 (1) and (2), to be submitted to SAHRA. As such the Basic Assessment report and its appendices must be submitted to the case as well as the EMPr, once it's completed by the Environmental Assessment Practitioner (EAP).

1.1 Terms of Reference

Field study

Conduct a field study to: (a) locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources affected by the proposed development.

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 the relevant legislation, SAHRA minimum standards 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 No 25 of 1999).

Table 3: Project Description

Size of farm and portions	The total extent of the proposed project activities will be approximately 65 ha located on Portion 1 and the remainder of the farm Dwarsrivier 372 KT
Magisterial District	Greater Tubatse Local Municipality
1: 50 000 map sheet number	1:50 000 topographical map 2430 CC
General co-ordinate of the development	24° 55' 17.7769" S, 30° 06' 45.6062" E

Table 4: Infrastructure and project activities

Type of development	Mining development
Project size	Approximately 65 hectares
Project Components	**Project 1: Resource and Reserve Drilling** As exploration is a dynamic process as part of the operational phase of the mine, an exploration programme has been developed to consider the possible area over a period of five (5) years. It is planned that exploration drilling will take place at the following areas: • Farm Dwarsrivier 372KT Portion 0: Exploration Drilling (access roads and approximately 25 drill pads) • Farm Dwarsrivier 372KT Remainder of Portion 1: Exploration Drilling (access roads and approximately 30 drill pads) • Farm Dwarsrivier 372KT Remainder of Portion 6: Exploration Drilling (access roads and approximately 250 drill pads) • Farm Dwarsrivier 372KT Remainder of Portion 7: Exploration Drilling (access roads and approximately 40 drill pads) The exploration activities are planned over the Dwarsrivier Mine Mining Rights, however, this will extend onto the Two Rivers Platinum Surface Rights, which includes the Two Rivers Platinum Mine Plant area, as well as Tailings Storage Facility (TSF) area. For the TSF, the exploration programme will allow a 100m buffer. **Project 2: The development of a number of Capital Project** <u>Low Grade Product Stockpiles</u> The current stockpile footprints of both the low-grade and high-grade material are not sufficient to accommodate additional stockpile requirements. This specifically occurred during 2017, when sufficient capacity was not available at the ports to store product, which in turn resulted in a chain reaction on site. The need for extension of the stockpile capacity at the plant is of critical importance to ensure flexibility in supply of chrome at the mine. The design of the facility must allow for the storage of three (3) months' production capacity based on a total of 1.7 million tons product produced per annum. The site will be located within the South Plant area but will extend into an area previously not cleared (1.5ha). <u>North Shaft Infrastructure</u>

	The north shaft infrastructure will be an upgrade project, where the following will be undertaken: 1. Existing temporary containers and security access will be removed, and the area rehabilitated; 2. New covered parking areas will be constructed for both visitors and employees. It is the intention of Dwarsrivier Mine to pave all walking, parking and road surfaces. 3. Walkways will be constructed within the North Shaft infrastructure area. These will be paved and clearly demarcated; 4. A new change house will be constructed for the underground personnel of the North Shaft. This system will tie into the existing water management system located at the South Mine, or into the planned Water Treatment Works (WTW) which will be constructed at the plant in the near future (approved as per the 2018 Environmental Authorisation); and 5. New, formally constructed offices will be constructed as brick buildings. 6. Two-way access roads will be constructed, which ties in with the Sekhukhune Road. This road will have a width of a maximum of 8m. The road will also include a traffic circle to manage the flow of traffic in this area. The overall length of the surface of this road will be approximately 920m. The only clearance required in this area is for the traffic circle and possibly on the curbs of the two-way road on the eastern side. An area of about 0.7ha clearance is foreseen. 7. A new Store and associated Office area will be constructed which will serve as the receiving bay for all equipment and material stored for the North Shaft activities. A one-direction road of approximately 6m wide, will be constructed to enter the area and exit the area on the other side. Access with be from the north-eastern corner of the stores, in a westerly direction with the exit located around the site on the south-eastern corner, via the two-way road. The length of this road will be approximately 160m. This area will be fenced off and have strict access control. 8. The current laydown area will be formalised in dedicated areas for the North Mine activities. Bunded areas will be constructed for the storage of oils, filters, batteries, or any other material which may cause an impact on the environment. This area will be fenced off and have strict access control. 9. No additional changes will be undertaken at the North Workshop area as this area has been recently upgraded through concreting surfaces and roofing areas where chemicals are stored. <u>Truck Parking Area</u> The mine has an existing truck parking facility which is located at the entrance to the South Mine Plant. This truck parking serves all receiving and exiting trucks. The mine currently receives on average 150 arriving trucks per day. These trucks enter the truck parking, where it is weighed at empty load. The necessary signage and requirements are then assessed and corrected where necessary, where after the trucks enter the plant area where chrome is uploaded. The trucks then return to the parking area, where it is again weighed at its full load and the tarpaulins are secured. The fact that this parking area receives 150 arrivals per day and must accommodate the existing trucks is leading to a logistical bottleneck, with trucks forced to park on the regional road. Studies conducted on the mine have indicated that there is a 36% reduction in processing time on days

	when high volumes of trucks are processed. For this reason, an alternative parking area must be identified. Three main options have been identified for the proposed parking area. With each of these options, the trucks will enter on the Two Rivers Mine Road and exit via the existing truck parking at the current mine entrance. The Two Rivers Main Road will be designed in consultation with the relevant Roads Department (i.e. to adhere to road design parameters). Trucks will be travelling in one direction on a single-lane road, a traffic circle will be allowed for to ensure that the truck can exist this area if they do not meet safety requirements. For the road construction, waste rock will be used depending on the mine obtaining exemption from Regulation 5 of Government Notice 704, 1999 (GN704) from the DWS, alternatively the roads will be scraped and maintained. The road will be located in such a manner not to cross the non-perennial drainage channel, running in an east to west direction (between the old TSF and current Discard Dump) and draining into the Groot Dwarsrivier. This channel formed part of a non-perennial drainage line, which was diverted during the time of opencast operations (lawfully in terms of the approved WUL) in the early 2000's to allow for safe mining practices. The diversion took place at North Mine along the eastern boundary of the site (east of the now North RWD). The channel of this drainage line is still present, and water is conveyed towards the Groot Dwarsrivier during rainfall periods. For Option 1, the parking area is proposed to the north of the Old TSF. The non-perennial drainage channel discussed earlier, is present approximately 30m to the north of this location, the trucks will enter to the west of the parking, and then tie into the existing road linking the plant and the Discard Dump. Trucks will be loaded at the plant where after the trucks will exit to the existing truck parking. For Option 2, the facility will be located to the west of the lower RWD, just east of the Two Rivers Mine Road. Trucks will enter this parking on the northern side, and will exit to the south, travelling on the existing road (Road C), linking the plant to the lower RWD. Trucks will then turn towards the plant, just after the Old TSF where the trucks will be loaded. A turning point will be required at this area, from where the trucks will follow the same road as for Option 1 (Road A). An alternative to this, will be to utilise Road B (indicated in purple), which is an existing road, traversing to the north of the Old TSF. From here the trucks will again tie up with the proposed Road A. For Option 3, the facility will be located to the south of the lower RWD, just north west of the upper RWD. This area is the most disturbed area of the three options. The trucks will enter this parking areas from the same access road as proposed for the other two options and will enter from a westerly direction and exist on the eastern perimeter of the proposed site. Trucks will then turn towards the plant, just after the Old TSF where the trucks will be loaded. A turning point will be required at this area, from where the trucks will follow the same road as for Option 1 (Road A). It is expected that the truck parking area will consist of an appropriate surface such as crushed rock, a fence to demarcate the area, a security building, lighting and other associated infrastructure. The roads will be cleared and compacted with waste rock should exemption in terms of GN704 for Regulation 5 be obtained. For the purpose of this report, the final location has not been determined. South Mine Laydown Area

	The mine has a current Laydown Area on South Mine, next to the Salvage Yard. It is the intention of the mine to formalise this Laydown Area and therefore expansion of the existing laydown area footprint is required. This area will be used for the storage of various materials and equipment used in the mining operation. Specifically demarcated bunded areas will be present for the storage of material, such as oil filters and batteries, which could cause environmental pollution if not contained. The area will be fenced off with strict access control measures. This area will also cater for the Core Shed, which will be used to store and assess all the cores collected from the exploration drilling activities. Treated Water Reservoir A Water Treatment Plant (WTP) is currently being constructed to treat and release excess water, or treat and reuse dirty water from Dam 26 with the aim to reduce the volumes of clean water abstraction from alluvial boreholes in the future – this requirement arose from the water balance and water management study and does not form part of this application, but rather as a commitment that the mine must investigate the required design for the intended purpose of treating dirty water to be reused in the mining process. The WTP is a condition of the 2008 WUL. The treated water will be discharged through the outlet to the proposed Treated (Clean) Water Reservoir, located just north of Dam 26, to the north-eastern corner of the WTP. The overall facility is located in an old contractor's yard, and therefore no vegetation clearance is required. Security Office Upgrades The existing entrance at the main offices currently comprises of a security access point and visitors parking. It is the intention of the mine to formalise this area into a formal security access area (brick building) and a more logistical layout for the parking to accommodate additional parking spaces. No additional clearance will be required for this purpose; however, an additional roadway will be required. This road will allow for a traffic circle to regulate traffic and will be about 8m in width with a maximum length of 250m, including the traffic circle. No clearance will be required for this activity as it will be located in the existing area. Topsoil Stockpile Expansion The clearance activities on site will allow for the maximum removal of topsoil from the proposed sites but will also necessitate additional areas for the stockpiling of such topsoil for rehabilitation purposes. For this reason, it is recommended that Topsoil Stockpile #3 [naming in terms of the Topsoil Management Plan (GCS, 2016)] be expanded. **Project 3: Diesel Storage** North Mine Fuel and Diesel Supply Similar to the Bulk Fuel Storage Area at South Mine, the North Mine requires a dedicated area to supply fuel and oils to the underground workshop. This area will comprise of two (2) 23m3 tanks, one for hydraulic oils and one for diesel. The area anticipated is located to the south-west of the North RWD. The tanks will be serviced and operated by Total (the planned new fuel supplier of the mine). The two tanks will be placed on concrete bunded systems, with a sump to capture any potential spills which may occur. Around the bunded area will be a smaller bunded area, in which the fuel filling pipes are located. Small diameter steel pipes will supply fuels to the underground workshops, though a cemented tunnel.

	Fuel and Oil Storage and Tank Decommissioning Dwarsrivier Mine is planning on appointing a new fuel supplier, Total. Due to transfer in service providers, the new supplier will be conducting studies on the current status of the existing tanks and in this process will remove the existing facilities and replace these with Total-type facilities. The removal (therefore decommissioning) of the existing facilities will specifically take place at the current South Mine MCC Workshop, as well as at the South Mine Bulk Fuel Supply System (the latter supplies fuel to the underground workings). In addition to this, the mine will be erecting two new facilities, one at the North Mine, within an existing cemented and bunded area, and one at the future Workshop Area at the plant. It is currently planned that the mine will store a total volume of 340m3 of fuel/ oils on site (excluding the underground fuel supply of North Mine - with this included the total storage capacity will be 386m3). It is planned that fuel and oil storage will take place at the following areas: Farm Dwarsrivier 372KT RE: North Shaft Fuel and Oil Storage. Farm Dwarsrivier 372KT RE: North Shaft Underground Fuel Supply. Farm Dwarsrivier 372KT Portion 1: South Mine Bulk Fuel and Oil Storage. Farm Dwarsrivier 372KT Portion 1: South Mine Main Stores Fuel and Oil Storage. Farm Dwarsrivier 372KT Portion 1: Plant Workshop. **Project 4: Discharge of water** The mine intents to discharge fissure water captured in the underground workings into the Groot Dwarsrivier. The attempt is to improve the water quality in the river system, as well as to reduce the volumes of water circulated within the mining operation. An application for a WUL, section 21c & i, as well as for section 21f will be undertaken.

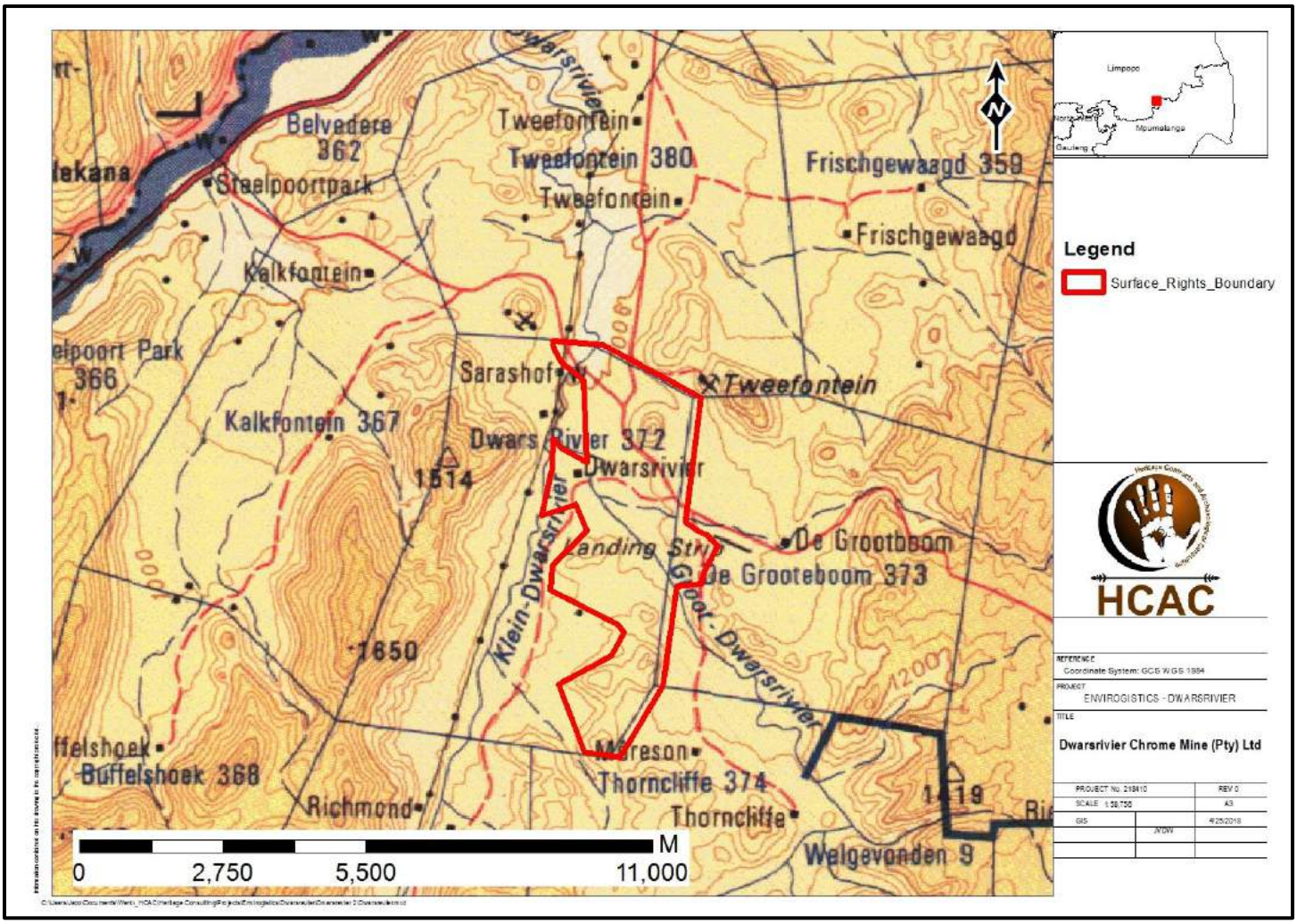


Figure 1. Provincial locality map (1: 250 000 topographical map) indicating Dwarsrivier mine surface rights area.

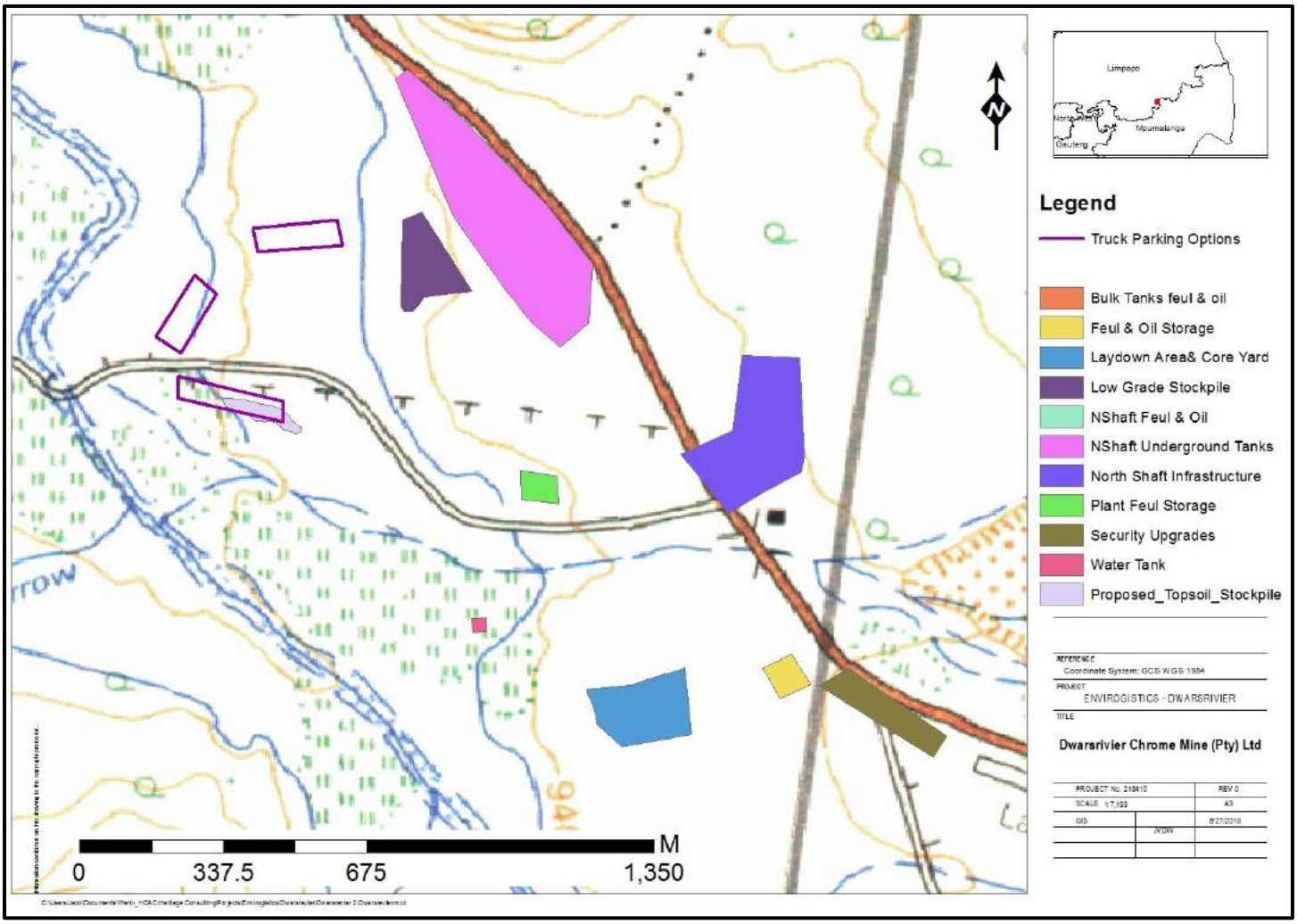


Figure 2. 1: 50 000 Locality Map with proposed infrastructure.

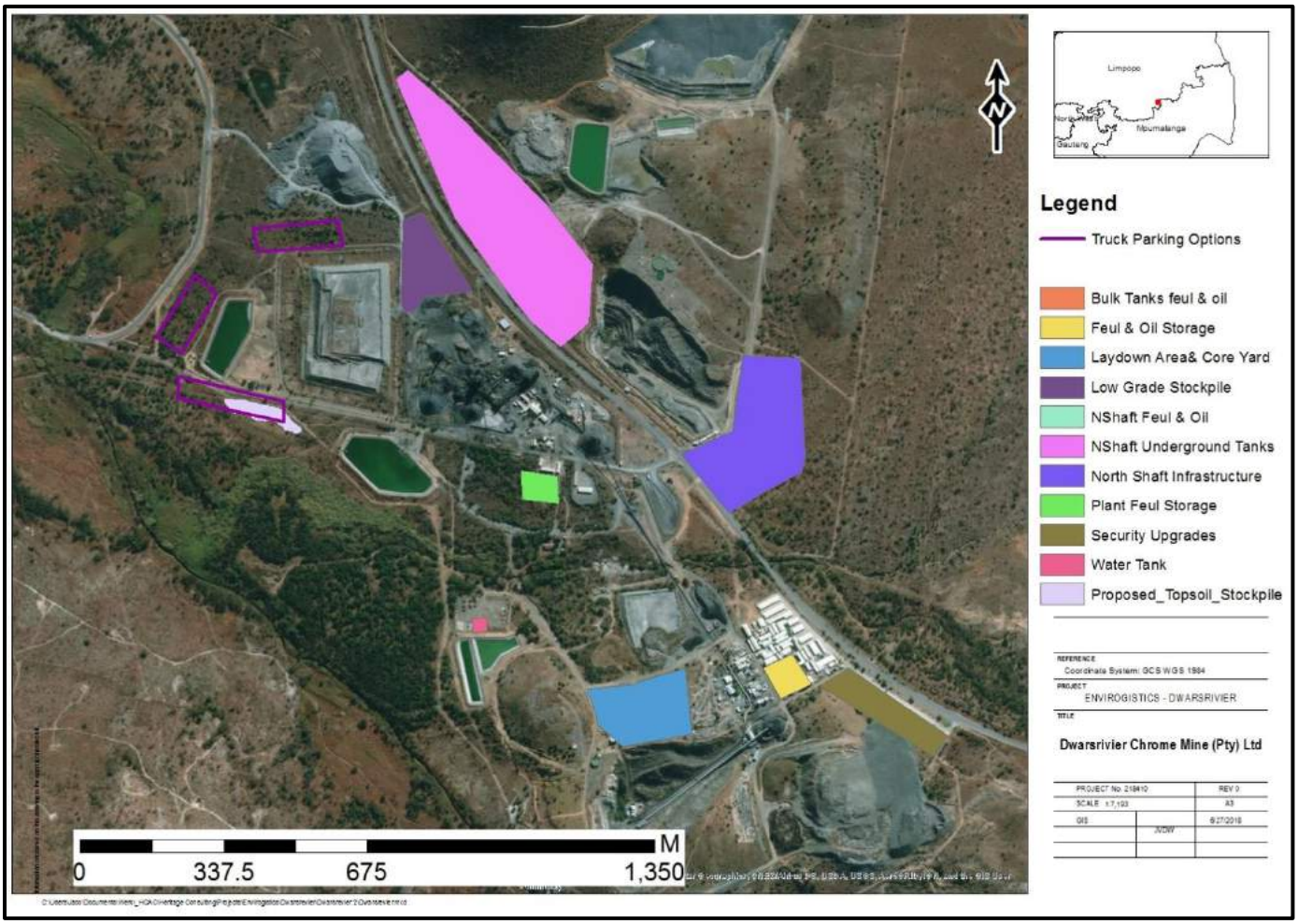


Figure 3: Satellite image indicating the development footprint within the existing mine.

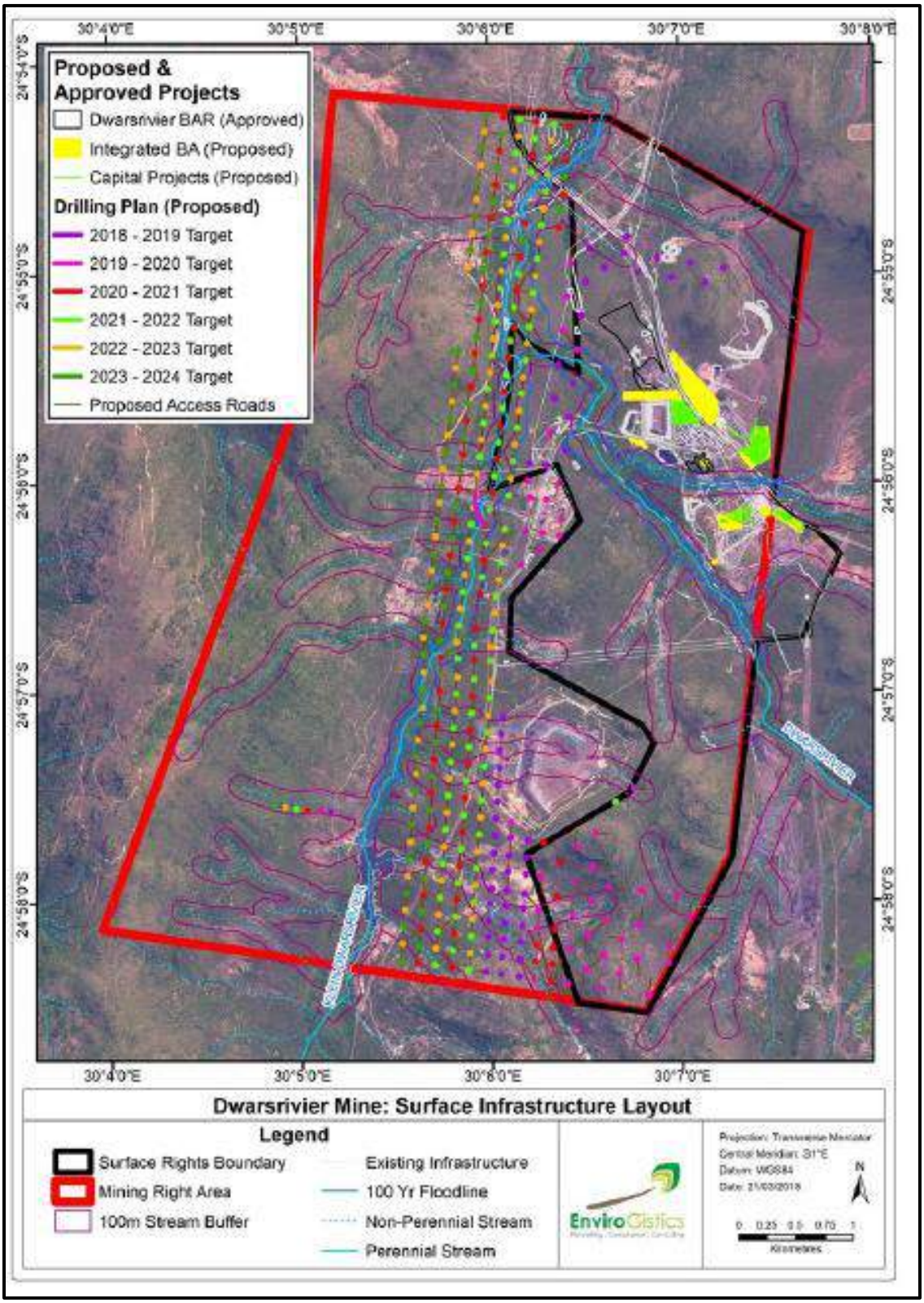


Figure 4. Proposed drilling plan and new projects.

2 Legislative Requirements

The HIA, as a specialist sub-section of the EIA, is required under the following legislation:

- National Heritage Resources Act (NHRA), Act No. 25 of 1999)
- National Environmental Management Act (NEMA), Act No. 107 of 1998 - Section 23(2)(b)
- Mineral and Petroleum Resources Development Act (MPRDA), Act No. 28 of 2002 - Section 39(3)(b)(iii)

A Phase 1 HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of 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; and
- Make recommendations for the appropriate heritage management of these impacts.

The HIA should be submitted, as part of the impact assessment report or EMPr, to the PHRA if established in the province or to SAHRA. SAHRA will ultimately be 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 impact assessment report and/or EMPr, 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 heritage 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 with SAHRA by the applicant 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).

3 METHODOLOGY

3.1 Literature Review

A brief survey of available literature was conducted to extract data and information on the area in question to provide general heritage context into which the development would be set. This literature search included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS).

3.2 Genealogical Society and Google Earth Monuments

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located; these locations were marked and visited during the field work phase. The database of the Genealogical Society was consulted to collect data on any known graves in the area.

3.3 Public Consultation and Stakeholder Engagement:

Stakeholder engagement is a key component of any EIA process, it involves stakeholders interested in, or affected by the proposed development. Stakeholders are provided with an opportunity to raise issues of concern (for the purposes of this report only heritage related issues will be included). The aim of the public consultation process was to capture and address any issues raised by community members and other stakeholders during key stakeholder and public meetings. The process involved:

- Placement of advertisements and site notices
- Stakeholder notification (through the dissemination of information and meeting invitations);
- Stakeholder meetings undertaken with I&APs;
- Authority Consultation
- The compilation of an Environmental Impact Assessment Report (EIA).

Please refer to section 6 for more detail.

3.4 Site Investigation

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 of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

Table 5: Site Investigation Details

	Site Investigation
Date	26 and 27 June 2018
Season	Winter. Vegetation is high hampering archaeological visibility however the impact areas of projects 2 - 4 were sufficiently covered to adequately record heritage resources (Figure 5). Due to the wide distribution of the drill pads and the fact that their location is subject to change it was not feasible to survey all of these areas. Large sections on Twin Rivers mine have been surveyed previously (Van Vollenhoven & Pelser 2001 and 2002 as well as Van Vollenhoven 2012 and 2013) and provides a baseline for these areas.

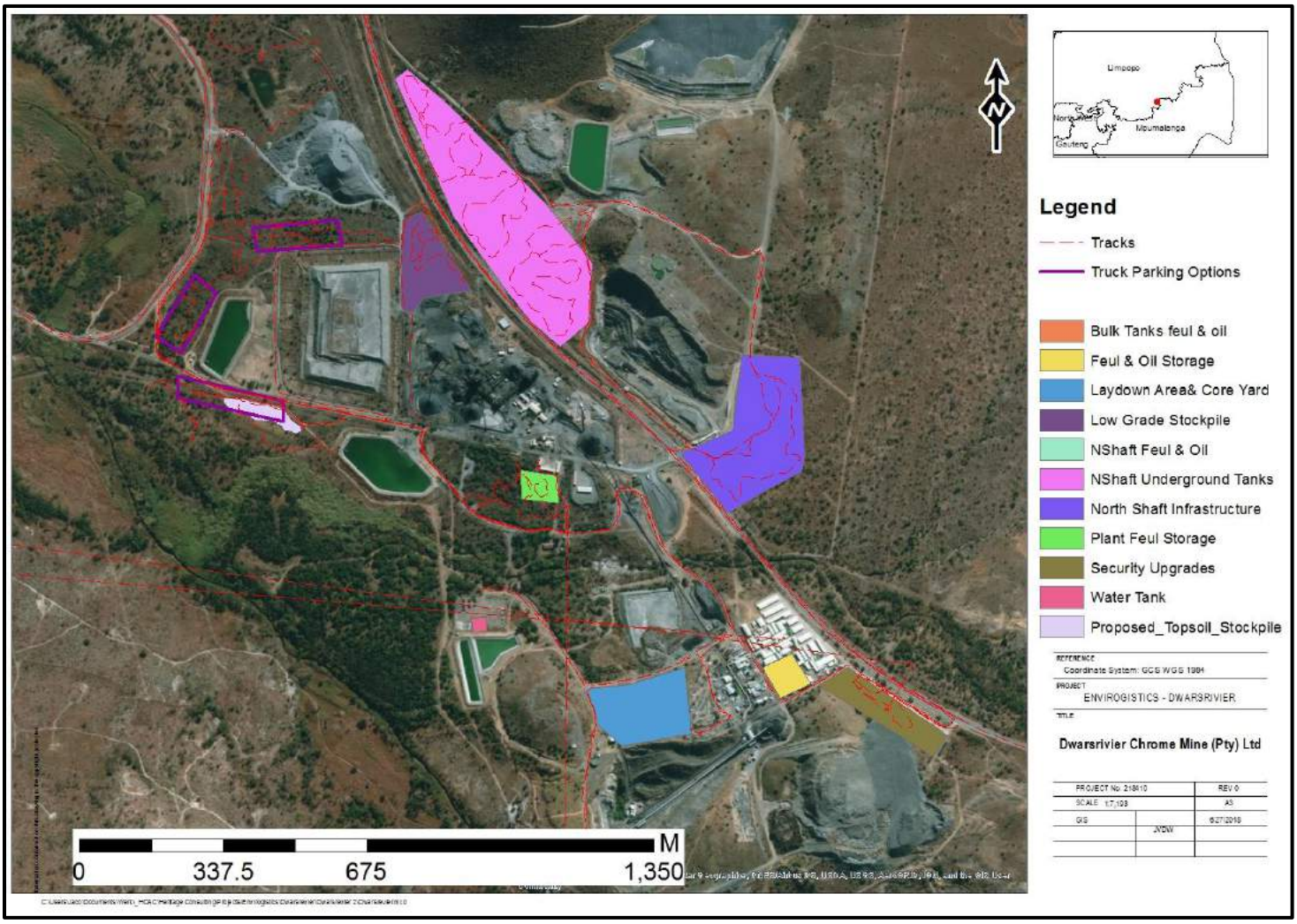


Figure 5: Track logs of the survey in red.

3.5 Site Significance and Field Rating

Section 3 of the NHRA 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.

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 with cognisance of Section 3 of the NHRA:

- 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; and
- Potential to answer present research questions.

In addition to this criteria field ratings 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 10 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

3.6 Impact Assessment Methodology

The criteria below are used to establish the impact rating on sites:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0-1 years), assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years), assigned a score of 2;
  - medium-term (5-15 years), assigned a score of 3;
  - long term (> 15 years), assigned a score of 4; or
  - permanent, assigned a score of 5;
  - The **magnitude**, quantified on a scale from 0-10 where; 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
  - The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where; 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
  - The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
  - the **status**, which will be described as either positive, negative or neutral.
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the *degree* to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:
S=(E+D+M) P
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).

3.7 Limitations and Constraints of the study

The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. 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. Similarly, the depth of the deposit of heritage sites cannot be accurately determined due its subsurface nature. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. Due to the wide distribution of the drill pads and that their location is subject to change it was not feasible to survey all of these areas. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

4 Description of Socio Economic Environmental

According to Stats Sa the following applies to the Thubatse Municipality: "*The population size is 335 676. The population in the municipality is constituted by 97,8% black African, 1,6% white people, with other population groups making up the remaining 0,7. The sex ratio in the municipality is 88, meaning that for every 100 women there are 88 men. Languages spoken in the municipality include Sepedi (78,6%), Tsonga (6,9%), isiNdebele (3,8%), isiZulu (2,1%) and other languages make up 8,6%. Of those aged 20 years and older, 22,6% have completed matric and 6,6% have some form of higher education…. The municipality has a weak economic base and high poverty levels. The Burgersfort town in the municipality has been identified as a growth point in the province because of its mining activities. A potential to grow the economic base in the municipality, through tourism, has been brought by the availability of natural resources. Poverty alleviation projects implemented by the municipality have improved the socio-economic conditions.*"

5 Description of the Physical Environment

The study area is situated approximately 60km northwest of Lydenburg, 25km south of Steelpoort and 63km northeast of Roossenekal in the Limpopo Province. The study area forms part of the Dwarsrivier Valley, part of the Bushveld Igneous Complex. Large sections of the study area have been transformed over the years firstly by agricultural activities and more recently by mining and mining related activities (Figure 5 – 8).

Figure 6. Existing laydown area.

Figure 7. Cleared areas at North Shaft.

Figure 8. Existing infrastructure at North Shaft .

Figure 9. Existing mining activities next to Met Grade expansion area.

6 Results of Public Consultation and Stakeholder Engagement:

6.1.1 Stakeholder Identification

Adjacent landowners and the public at large were informed of the proposed activity as part of the EIA process. Site notices and advertisements notifying interested and affected parties were placed at strategic points and in local newspapers as part of the process.

7 Literature / Background Study:

7.1 Literature Review

In anticipation of other mining activities in the greater study area, archaeologists have completed numerous heritage surveys including Huffman & Schoeman 2001, 2002 a and b; van Schalkwyk 2005; Roodt 2003a, 2003b, 2003c, 2005, 2008a, 2008b; Van der Walt & Fourie 2006; Van der Walt & Celliers 2009; Van der Walt 2009; 2016, 2017 and Pistorius 2007, 2010, 2011 as well as Van Vollenhoven and Pelser 2001, 2002 and Van Vollenhoven 2012 and 2013 for various Environmental Impact Assessment Reports (EIAs) and Environmental Management Programmes (EMPs). These studies provide a good understanding of the archaeology of the area and use of the wider landscape. Since 2001, heritage surveys have recorded more than 240 sites in the greater study area, ranging from the Middle Stone Age to the recent households of farm labourers.

The distribution of the sites on the landscape show different land use patterns. Many agriculturally-orientated societies (making *Eiland, Leolo* and *Marateng* pottery) built their villages in the valleys near cultivatable alluvium. Others (probably Ndebele) built terraced-settlements on basal slopes of the valley edge, while farm labourers usually lived in the valleys as well. During the 19th Century, farmers lived around the edge of high meadows as a measure of protection. A few Middle Iron Age Eiland sites were also cited in this plateau environment.

7.1.1 Genealogical Society and Google Earth Monuments

No known grave sites are indicated in the study area however grave sites can be expected anywhere on the landscape and several grave sites have been recorded (e.g., Van Vollenhoven & Pelser 2001) in the project area. .

7.2 General History of the area

7.2.1 Archaeology of the area

The archaeological record for the greater study area consists of the Stone Age and Iron Age.

7.2.1.1 Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management (CRM) purposes it is often only expected/ possible to identify the presence of the three main phases.

Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard 2012). The three main phases can be divided as follows:

- Later Stone Age: associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago
- Middle Stone Age: associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
- Earlier Stone Age: associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago.

Middle Stone Age isolated artefacts are found scattered over the landscape. Finds typically include radial cores, triangular points and flakes. These artefacts are scattered too sparsely to be of any significance (Van der Walt 2016).

7.2.1.2 The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. Most of the decorated pottery found in the study area belongs to the stylistic facies known as *Eiland*. This style dates to between 1550 AD and 1750 AD and was made by Sotho-Tswana people (Huffman 2007: 186-189). These Middle Iron Age Sites do not have any stone walling associated with them and is found close to cultivatable soil. Some stylistic *Marateng* pottery were also recorded presumably in association with Late Iron Age stone walled settlements. *Marateng* pottery dates to between 1650 AD and 1840 AD (Huffman 2007: 207).

7.3 Historical Information

European occupation began in 1845 when trekkers established Ohrigstad and then Lydenburg a few years later. Originally, the trekkers were interested in ivory, but they also needed land and labour for agriculture. Tensions with African communities over these needs rose to such a point that the Trekkers attacked the Pedi capital in 1852. They failed, however, to destroy Pedi authority. Somewhat later, they negotiated a peace with Sekwati and traded cattle for land. Boers then started to establish farms in the region. GS Maree, for example, settled on Mareesburg in 1871. Tensions over land and labour increased again until the ZAR attacked the Pedi capital in 1876: this battle also failed to break Pedi resistance.

This brief historical outline helps to date some other sites in the study area. In particular, a number of settlements located around high meadows probably date from 1860 to 1880, when tensions were high but before major European occupation of local farms

7.3.1 Anglo-Boer War

The Anglo-Boer War was the greatest conflict that had taken place in South Africa up to date. No sites relating to the war are known to occur in the study area.

7.3.2 Cultural Landscape

The site under investigation is located about 14 kilometres south west of Steelpoort, and about 13 km east of the R555 Main Road in Mpumalanga Province in an area that is extensively mined. The greater area has been extensively disturbed by previous developments and the proposed projects are in line with the land use in the surrounding area. Please see historical maps in Appendix B.

8 Findings of the Survey

A primarily desktop-based heritage study supplemented by a brief field visit was conducted for **Project 1** located on the Two Rivers surface right area. Previous CRM surveys (Van Vollenhoven & Pelser 2001, 2002, Steggman & Roodt 2012 as well as Van Vollenhoven 2012 and 2013) conducted for this area recorded 21 sites ranging from ruins, mine adits, graves to Iron Age and Stone Age sites (Table 6). The recorded sites are mostly located in areas not previously impacted on by the existing mining operations in the area (Figure 10). In addition a National Monument were recorded and 3 clusters of buildings from 1: 50 000 maps (Table 7 and Figure 10).

Table 6: Known sites

Site no.	Type Site	Co-Ordinate	Author
MH 1	Dwellings	S24 56’ 02.4” E30 05’ 37.2”	Stegmann & Roodt (2012)
MH 2	Masha Settlement	S24º 56’ 12.0” E30º 05’ 25.9”	Stegmann & Roodt (2012)
NSH1	Historical Adit	S24º 54’ 57.4” E30º 05’ 35.4”	Stegmann & Roodt (2012)
SIA 1	Eiland Iron Age Site	S24º 57’ 58.3” E30º 05’ 52.9”	Stegmann & Roodt (2012)
SIA 2	Possible Marateng Site	S24º 58’ 08.5” E30º 05’ 53.8”	Stegmann & Roodt (2012)
MIA 1	Possible Marateng Site	S24º 56’ 12.0” E30º 05’ 25.9”	Stegmann & Roodt (2012)
MG 1	Graves	S24º 56’ 14.1”	Stegmann & Roodt (2012)

		E30º 05’ 33.1”	
MG 2	Graves	S24º 56’ 14.0” E30º 05’ 32.2”	Stegmann & Roodt (2012)
MG 3	Graves	S24º 56’ 08.1” E30º 05’ 34.0”	Stegmann & Roodt (2012)
01/1	Iron Age Site	S24 57’ 01” E30 05’ 27”	Van Vollenhoven & Pelser (2001)
01/2	Iron Age	S24 57’ 09” E30 06’ 17”	Van Vollenhoven & Pelser (2001)
01/3	Graves	S24 56’ 58” E30 06’ 08”	Van Vollenhoven & Pelser (2001)
01/4	Historical Dwelling	S24 56’ 54” E30 06’ 08”	Van Vollenhoven & Pelser (2001)
01/5	Farm Labourer Dwelling	S24 57’08” E30 06’ 39”	Van Vollenhoven & Pelser (2001)
01/6	Graves	S24 57’ 09” E30 06’ 17”	Van Vollenhoven & Pelser (2001)
01/7	Graves	S24 57’ 02” E30 06’ 20”	Van Vollenhoven & Pelser (2001)
01/8	Graves	S24 57’ 07” E30 06’ 26”	Van Vollenhoven & Pelser (2001)
01/9	Graves	S24 57’ 02” E30 06’ 12”	Van Vollenhoven & Pelser (2001)
01/10	Graves	S24 56’ 50” E30 06’ 05”	Van Vollenhoven & Pelser (2001)
02/1	Stone Age	S24° 57’ 00” E30° 05’ 20”	Van Vollenhoven & Pelser (2002)
02/2	Iron Age	S24° 57’ 06” E30° 05’ 20”	Van Vollenhoven & Pelser (2002)

Table 7: Newly recorded sites

Site name.	Type Site	Co-Ordinate	Source
National Monument	Geological	S24° 54' 36.4754" E30° 06' 11.4287"	HCAC 2018
Sarashof	Farmhouse	S24° 54' 35.3477" E30° 06' 06.4004"	1:50 000 topographical map
Dwarsrivier 1	Possibly Farmhouse and outbuilding	S24° 55' 02.5012" E30° 05' 58.9384"	1:50 000 topographical map
Dwarsrivier 2	Possibly Farmhouse and outbuilding	S24° 55' 43.0380" E 30° 06' 21.3071"	1:50 000 topographical map

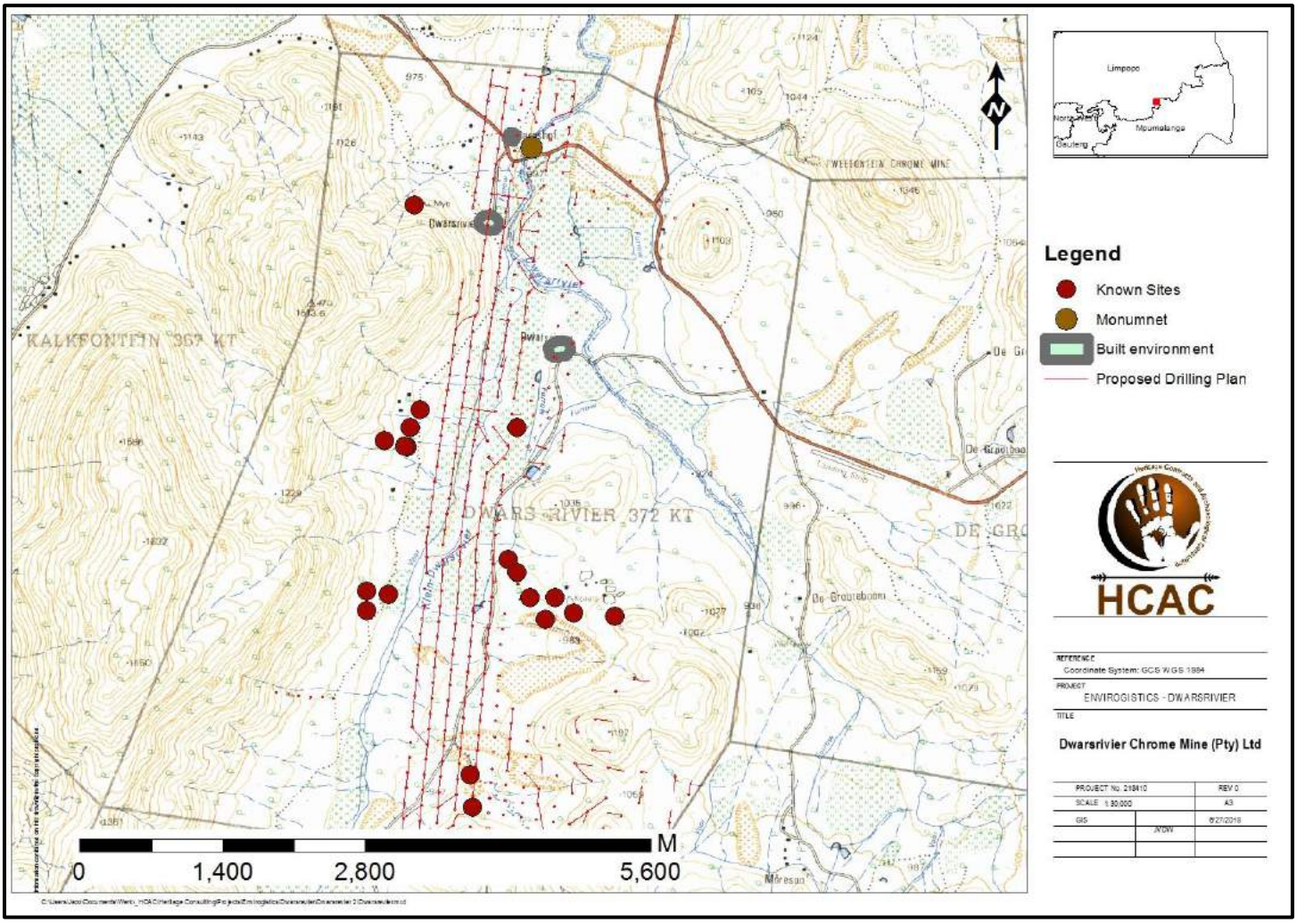


Figure 10: Site distribution in relation to the proposed drilling plan.

In terms of **project 2 - 4** the proposed developments are located within areas already impacted on by mining activities and no sites of significance were recorded in these areas.

8.1 Built Environment (Section 34 of the NHRA)

Three structures were identified from 1:50 000 Topographic Maps in the study area for Project 1 (Table 7 & Figure 10). These structures will not be directly impacted on as per the current Drilling plan, but if these structures are still standing care should be taken to avoid the structures during exploration. No standing structures older than 60 years occur in the impact area of Project 2,3 and 4.

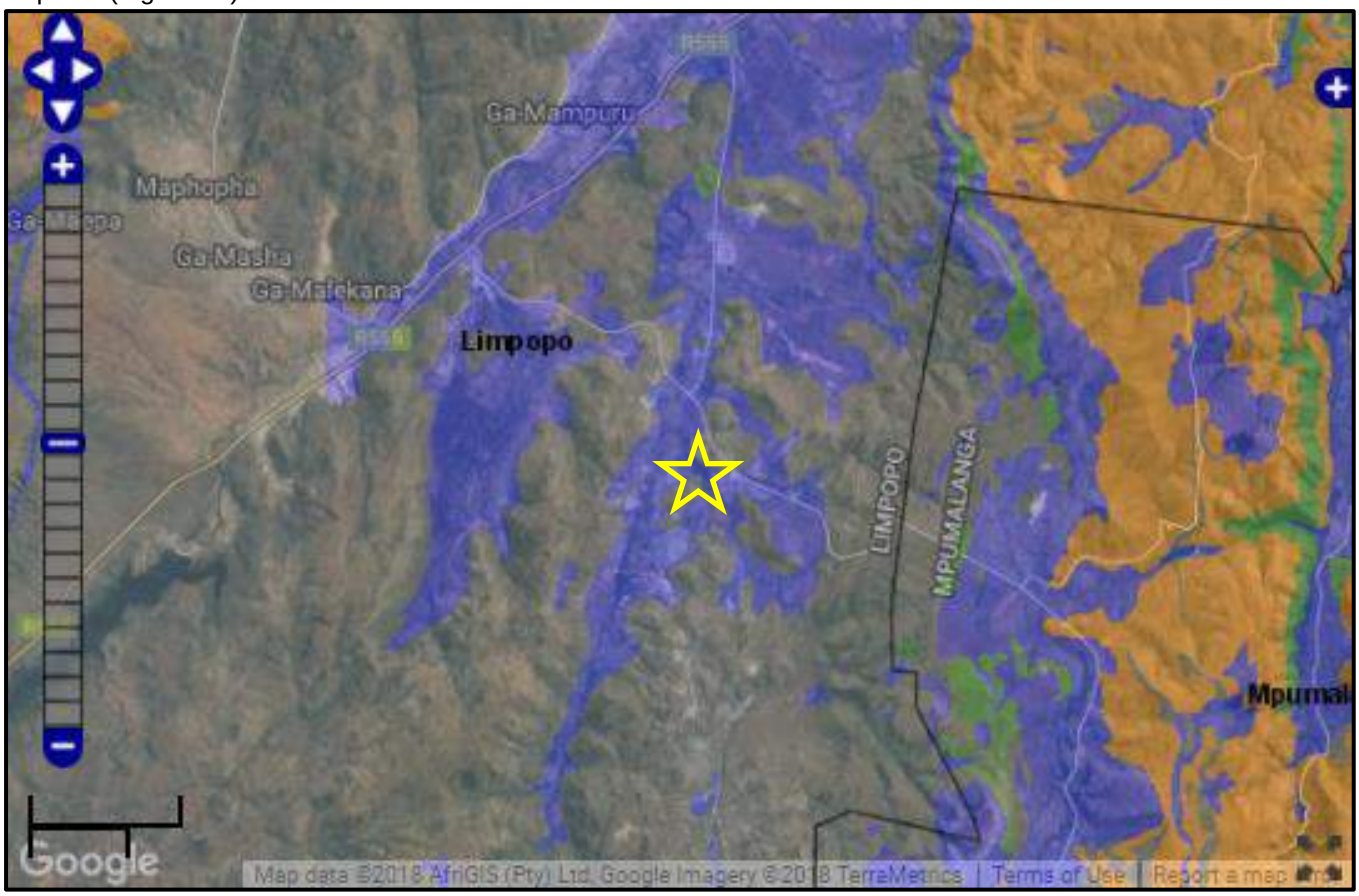
8.2 Archaeological and palaeontological resources (Section 35 of the NHRA)

In the impact area of Project 1 two Iron Age sites were recorded by Stegman & Roodt (2012). The sites comprise a possible Eiland facies site (SIA1) located at S24º 57' 58.3" E30º 05' 52.9" as well as a cattle enclosure (SIA 2) that was recorded near the foothill of the mountain. The enclosure belongs to either the Marateng groups or Masha Tribe (Stegmann & Roodt 2012). The authors could not confirm this as no ceramics could be located due to the dense vegetation. The area was located by distinct changes in type of grass growing in the immediate vicinity of the enclosure. The Authors did not allocate a field rating or significance to the site.

No archaeological sites or artefacts of significance was recorded in the impact areas of Project 2, 3 and 4. Widely scattered MSA artefacts are found in the study area but these artefacts are out of context and of no heritage significance apart from noting their presence in this report.

Figure 11. Isolated MSA artefacts on hornfelss in the study area.

Based on the SAHRA paleontological map the area is of no and low significance and no further studies are required (Figure 11).



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No paleontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No paleontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 12. Paleontological Sensitivity of the study area (star) is indicated as insignificant and low.

The well-known geological monument referred to as the “Dwarsrivier National Monument” is located close to some of the drill pads and marks an area with rare geological phenomena.

Figure 13. View of the monument.

Figure 14. Inscription on the monument.

Figure 15. “Zebra-striped” rocks marking the Bushveld Complex.

Figure 16. “Zebra-striped” rocks marking the Bushveld Complex.

Field Rating: GP A - High significance

8.3 Burial Grounds and Graves (Section 36 of the NHRA)

In terms of Section 36 of the Act graves were recorded in the impact area of Project 1 by Van Vollenhoven and Pelser (2001). The site (01-3) comprises 7 graves of which 2 have headstones and date to 1958 and 1978 based on the inscriptions the other 5 graves are unmarked. The site is located at S24 56’ 58”and E30 06’ 08”. Graves are of high social significance.

No burial sites were recorded in the impact areas of Project 2,3 and 4.

8.4 Cultural Landscapes, Intangible and Living Heritage.

Long term impact on the cultural landscape is considered to be low as the surrounding area is extensively mined. Visual impacts to scenic routes and sense of place are also considered to be low as the development is in line with the existing mining character of the area.

8.5 Battlefields and Concentration Camps

There are no battlefields or concentration camp sites in the study area.

8.6 Potential Impact

The following sites SIA 1, SIA 2, 01/3 as well as the National Monument, Sarashof, Dwarsrivier 1 and Dwarsrivier 2 are in close proximity to the drill pads relating to project 1 and can be directly or indirectly impacted on by the exploration expansion activities (Table 8, Figure 17, 18 and 19). If the correct mitigation measures are implemented, impacts on the recorded Iron Age sites, structures and graves can be avoided or managed to an acceptable level. Many agriculturally-orientated societies (making *Eiland, Leolo* and *Marateng* pottery) built their villages in the valleys near cultivatable alluvium and therefore additional previously unknown heritage sites can be expected in the impact area of Project 1. The impact area for Project 1 should be monitored during drilling to avoid accidental impacts to heritage sites. Any direct impacts that can occur would be during the drilling phase only.

Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of the development, it will, with the recommended mitigation measures and management actions, not impact any significant heritage resources directly. However, this and other projects in the area could have an indirect impact on the heritage landscape.

Table 8. Sites in close proximity to drill pads and recommended buffer zones

Site	Location	Buffer Requirements	Significance
Iron Age			
SIA 1	S24º 57' 58.3" E30º 05' 52.9"	50m	Not assessed by Stegmann and Roodt (2012)
SIA 2	S24º 58' 08.5" E30º 05' 53.8"	50m	Not assessed by Stegmann and Roodt (2012)
Monument			
Monument	S24° 54' 36.4754" E30° 06' 11.4287"	100m	High
Structures			
Structures 1 (Sarashof)	S24° 54' 35.3477" E30° 06' 06.4004	30m	TBC
Dwarsrivier 1 (Farmhouse and Outbuilding)	S24° 55' 02.5012" E30° 05' 58.9384	30m	TBC
Dwarsrivier 2 (Farmhouse and Outbuilding)	S24° 55' 43.0380" E30° 06' 21.3071"	30m	TBC
Graves			
Burial Sites (01/3)	S24 56' 58" E30 06' 08"	50m	High

8.6.1 Pre-Construction phase:

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.6.2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.6.3 Operation Phase

No impact is envisaged for the recorded heritage resources during this phase.

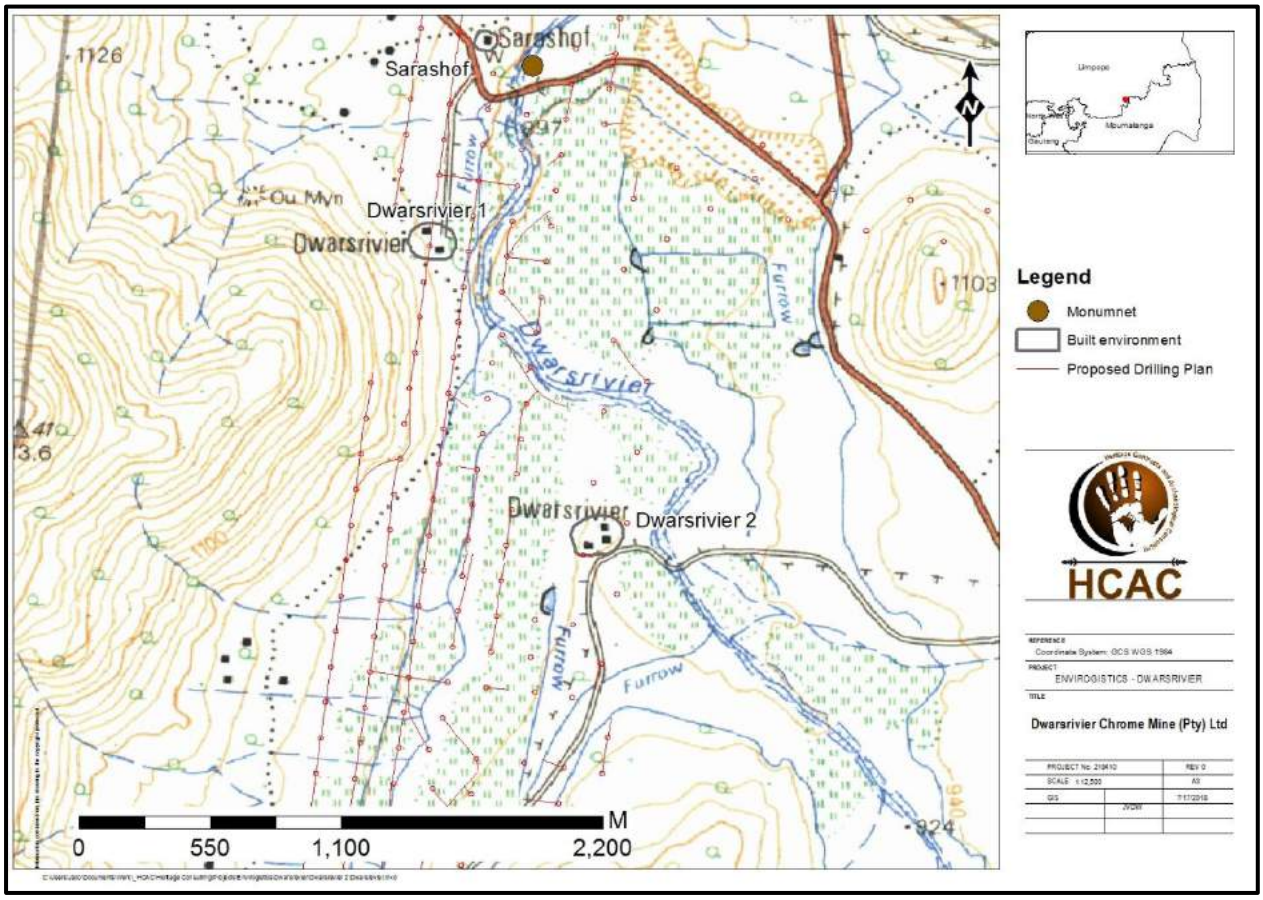


Figure 17. Structures (Sarashof & Dwarsrivier 1 and 2) in relation to Project 1.

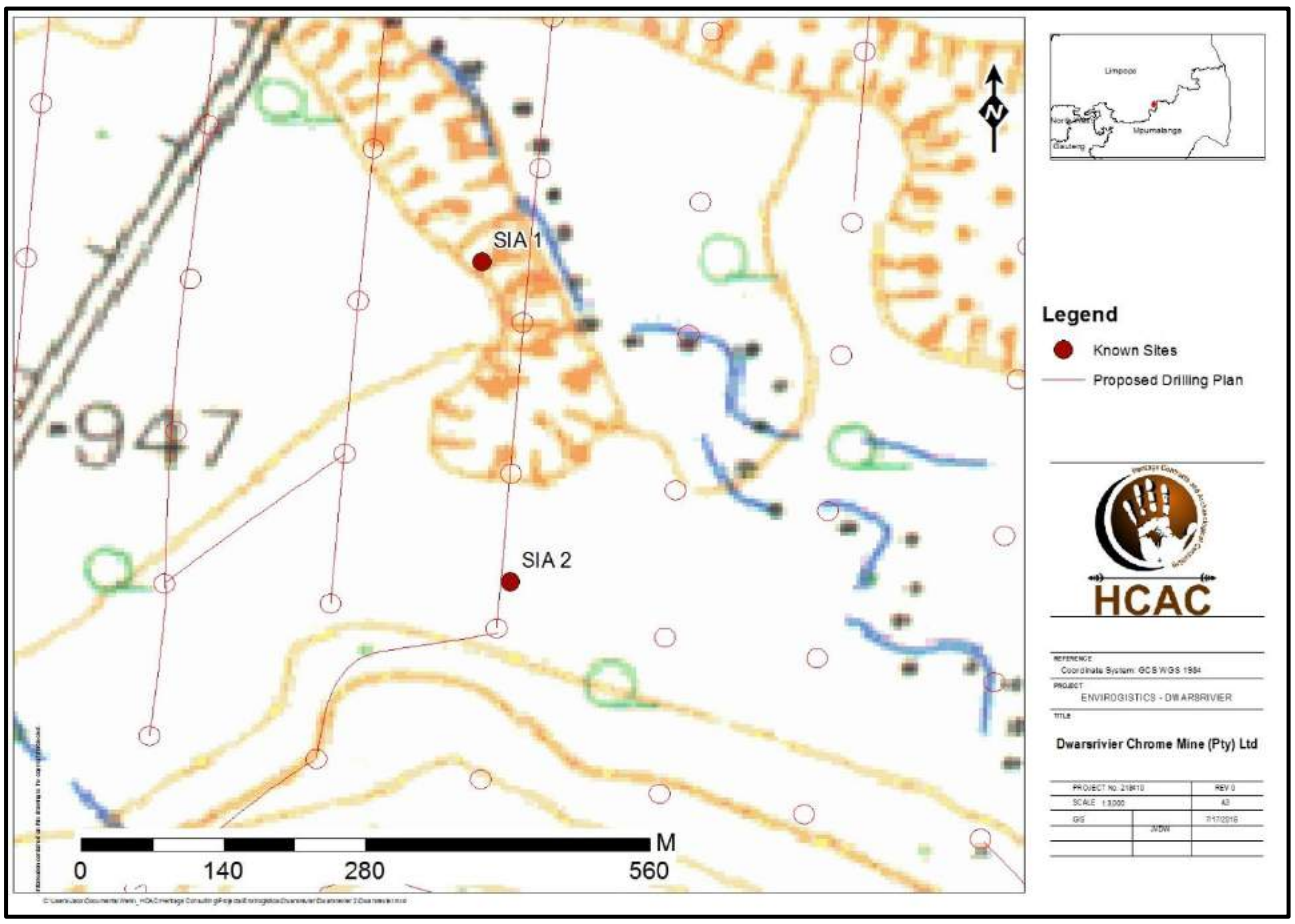


Figure 18. Iron Age sites in relation to Project 1.

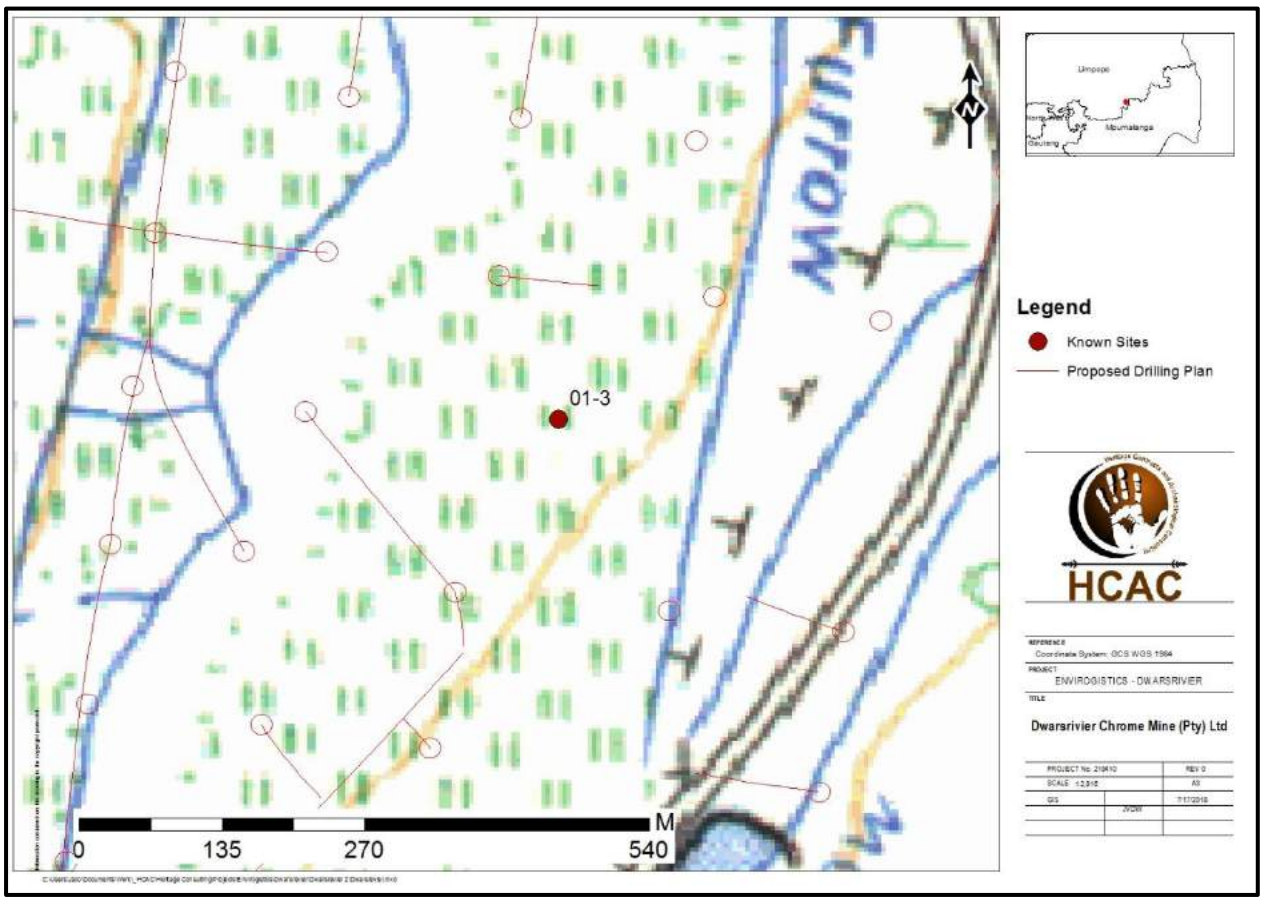


Figure 19. Known graves in relation to Project 1.

Table 9. Impact Assessment of the project on heritage resources

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Local (3)	Local (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (2)
Probability	Probable (3)	Not probable (2)
Significance	**36 (Medium)**	**20 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: It is recommended that the structures (Sarashof, Dwarsrivier 1 & 2) should be avoided with a 30 m buffer zone by exploration activities. The 2 Iron Age sites (SIA 1 & 2) should be avoided by the exploration activities with a 50 m buffer and the monument with a 100 m buffer zone. Graves and cemeteries are of high social significance, and it is recommended that the known grave site (01-3) should be demarcated and preserved *in situ*. The presence of graves or lack thereof in the study area should be confirmed by the community liaison officer during the social consultation process. A chance find procedure should be implemented for the project 1 -3. A management plan including monitoring should be implemented during construction for Project 1.		
Cumulative impacts: The surrounding area is characterised by mining developments and due to the possible impacts on non-renewable heritage resources in a mostly undeveloped area (Project 1) the cumulative impact for the exploration expansion is medium. The development areas for Project 2,3 and 4 have been previously disturbed and therefore the cumulative impact of these projects is considered to be low.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.		

Table 10. EMPR management measures

OBJECTIVE: To preserve and mitigate non-renewable heritage resources in the study area.	
Project component/s	Heritage resources can be impacted by the pre-construction and construction activities of the project.
Potential Impact	Irreplaceable loss of heritage resources in the study area and depletion of the archaeological database of the area.
Activity/risk source	Activities such as vegetation clearing and construction could destroy archaeological resources.
Mitigation: Target/Objective	Implementation of a Chance Finds procedure and management plan to mitigate accidental damage to previously unrecorded heritage resources. Preservation of known sites and graves in situ.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Implement a Chance Finds Procedure to ensure that if any heritage resources are uncovered that these are reported and correctly mitigated.	ECO	Daily
Development of a heritage management plan	Dwarsrivier Mine	Prior to commencement of activities

Performance Indicator	• Structures, Iron Age sites and Graves should be retained *in situ*. • Heritage impacts should be considered in any future development in the area. • Implementation of a chance find procedure i.e. immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
Monitoring	The ECO should monitor the known heritage resources during construction and the possible occurrence of subsurface heritage resources regularly.

9 Conclusion and recommendations

HCAC was appointed to conduct a Heritage Impact Assessment for the establishment of various projects and the expansion of the exploration programme at Dwarsrivier Chrome Mine, Steelpoort, Limpopo province to determine the presence of cultural heritage sites and the impact of the proposed development on these non-renewable resources.

The study areas comprised 4 projects namely:

- Project 1 Expansion of the exploration programme
- Project 2 Capital Projects
- Project 3 Diesel Storage
- Project 4 Water Discharge

The impact areas were assessed both on desktop level and by a non-intrusive pedestrian survey. Due to the size of the exploration area and the fact that drill pad locations are subject to change these areas were not intensively surveyed. Furthermore, several previous heritage studies were conducted for these areas (Van Vollenhoven & Pelser 2001, 2002, Stegmann & Roodt 2012 as well as Van Vollenhoven 2012 and 2013). From the desktop study it is clear that the archaeology of the wider region has been recorded through several CRM projects in the area (e.g. Van Vollenhoven & Pelser 2001 and 2002 as well as Van der Walt 2017 and 2018) and ranges from the Middle Stone Age (MSA) to the recent households of farm labourers. Their distributions on the landscape show different land use patterns.

Large portions of the study area are characterised by existing mining operations that would have impacted on surface indicators of heritage sites and apart from isolated widely scattered MSA artefacts (of low significance) no archaeological sites of significance were recorded during the survey for the Capital projects and Diesel Storage. In terms of the exploration programme two Iron Age sites were recorded by Stegman & Roodt (2012), these areas should be avoided with a 50-meter buffer zone around the sites. Many agriculturally-orientated societies (making *Eiland, Leolo* and *Marateng* pottery) built their villages in the valleys near cultivatable alluvium and therefore additional previously unknown heritage sites can be expected in the impact area of Project 1.

The study area is indicated as of low to insignificant palaeontological sensitivity on the SAHRA palaeontological map. This is corroborated by a paleontological study (Rossouw 2017) that found that the Dwarsrivier mine area is underlain by paleontologically insignificant intrusive igneous rocks and there is little chance of finding fossil material. The well-known geological monument referred to as the “Dwarsrivier National Monument” is located close to some of the drill pads and will have to be preserved with a buffer zone of 100 meters. No further mitigation prior to construction is recommended in terms of the archaeological and paleontological components of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the impact areas for the Capital Projects and Diesel Storage (including decommissioning of existing facilities). Several buildings were however identified from the desktop study close to drill pads and should be avoided with a 30-meter buffer zone. In terms of Section 36 of the Act several burial sites are known to exist in the larger project area. However no burial sites are on record for the areas of impact. If any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. The area is extensively mined and the proposed project is in line with the current land use and will not impact negatively on significant cultural landscapes or viewscapes. During the public participation process conducted for the project no heritage concerns was raised.

Sources of risk were identified that may impact on heritage resources (Table 2). These risks will be primarily associated with clearing of vegetation and topsoil. These risks and associated impacts may be avoided and minimised with the correct mitigation measures in place.

The impact of the proposed project on heritage resources is can be mitigated to an acceptable level with the correct mitigation measures and it is recommended that the proposed project can commence on the condition that the recommendations as outlined below are adhered to and following chance find procedure is implemented as part of the EMPr and based on approval from SAHRA.

- The known Iron Age sites should be avoided with a 50-meter buffer zone
- The structures should be avoided with a 30-meter buffer zone
- Known graves should be indicated on development plans and avoided.
- Development of a Heritage management plan
- Implementation of a Chance find procedure during construction

9.1. Chance Find Procedures

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below.

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.

9.2. Reasoned Opinion

The impact of the proposed project on heritage resources is considered low and no further pre-construction mitigation in terms of archaeological resources is required based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures (i.e. chance find procedure) are implemented for the project.

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11. Appendices:

Curriculum Vitae of Specialist

Jaco van der Walt
Archaeologist

jaco.heritage@gmail.com
+27 82 373 8491
+27 86 691 6461

Education:

Particulars of degrees/diplomas and/or other qualifications:

Name of University or Institution:		University of Pretoria
Degree obtained	**:**	BA Heritage Tourism & Archaeology
Year of graduation	**:**	2001
Name of University or Institution:		University of the Witwatersrand
Degree obtained	**:**	BA Hons Archaeology
Year of graduation	**:**	2002
Name of University or Institution	**:**	University of the Witwatersrand
Degree Obtained	**:**	MA (Archaeology)
Year of Graduation	:	2012
Name of University or Institution	**:**	University of Johannesburg
Degree	**:**	PhD
Year	:	Currently Enrolled

EMPLOYMENT HISTORY:

2011 – Present:	**Owner – HCAC (Heritage Contracts and Archaeological Consulting CC)**.
2007 – 2010 :	**CRM Archaeologist,** Managed the Heritage Contracts Unit at the University of the Witwatersrand.
2005 - 2007:	**CRM Archaeologist**, Director of Matakoma Heritage Consultants
2004:	**Technical Assistant**, Department of Anatomy University of Pretoria
2003:	**Archaeologist**, Mapungubwe World Heritage Site
2001 - 2002:	**CRM Archaeologists,** For R & R Cultural Resource Consultants, Polokwane
2000:	**Museum Assistant**, Fort Klapperkop.

Countries of work experience include:

Republic of South Africa, Botswana, Zimbabwe, Mozambique, Tanzania, The Democratic Republic of the Congo, Lesotho and Zambia.

SELECTED PROJECTS INCLUDE:

Archaeological Impact Assessments (Phase 1)

Heritage Impact Assessment Proposed Discharge Of Treated Mine Water Via The Wonderfontein Spruit Receiving Water Body Specialist as part of team conducting an Archaeological Assessment for the Mmamabula mining project and power supply, Botswana

Archaeological Impact Assessment Mmamethlake Landfill

Archaeological Impact Assessment Libangeni Landfill

Linear Developments

Archaeological Impact Assessment Link Northern Waterline Project At The Suikerbosrand Nature Reserve

Archaeological Impact Assessment Medupi – Spitskop Power Line,

Archaeological Impact Assessment Nelspruit Road Development

Renewable Energy developments

Archaeological Impact Assessment Karoshoek Solar Project

Grave Relocation Projects

Relocation of graves and site monitoring at Chloorkop as well as permit application and liaison with local authorities and social processes with local stakeholders, Gauteng Province.

Relocation of the grave of Rifle Man Maritz as well as permit application and liaison with local authorities and social processes with local stakeholders, Ndumo, Kwa Zulu Natal.

Relocation of the Magolwane graves for the office of the premier, Kwa Zulu Natal

Relocation of the OSuthu Royal Graves office of the premier, Kwa Zulu Natal

Phase 2 Mitigation Projects

Field Director for the Archaeological Mitigation For Booysendal Platinum Mine, Steelpoort, Limpopo Province. Principle investigator Prof. T. Huffman

Monitoring of heritage sites affected by the ARUP Transnet Multipurpose Pipeline under directorship of Gavin Anderson.

Field Director for the Phase 2 mapping of a late Iron Age site located on the farm Kameelbult, Zeerust, North West Province. Under directorship of Prof T. Huffman.

Field Director for the Phase 2 surface sampling of Stone Age sites effected by the Medupi – Spitskop Power Line, Limpopo Province

Heritage management projects

Platreef Mitigation project – mitigation of heritage sites and compilation of conservation management plan.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:

- Association of Southern African Professional Archaeologists. Member number 159

  Accreditation:
  - Field Director Iron Age Archaeology
  - Field Supervisor Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation
- Accredited CRM Archaeologist with SAHRA
- Accredited CRM Archaeologist with AMAFA
- Co-opted council member for the CRM Section of the Association of Southern African Association Professional Archaeologists (2011 – 2012)

PUBLICATIONS AND PRESENTATIONS

- A Culture Historical Interpretation, Aimed at Site Visitors, of the Exposed Eastern Profile of K8 on the Southern terrace at Mapungubwe.
  - J van der Walt, A Meyer, WC Nienaber
  - Poster presented at Faculty day, Faculty of Medicine University of Pretoria 2003
- 'n Reddingsondersoek na Anglo-Boereoorlog-ammunisie, gevind by Ifafi, Noordwes-Provinsie. South-African Journal for Cultural History 16(1) June 2002, with A. van Vollenhoven as co-writer.
- Fieldwork Report: Mapungubwe Stabilization Project.
  - WC Nienaber, M Hutten, S Gaigher, J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2004
- A War Uncovered: Human Remains from Thabantšho Hill (South Africa), 10 May 1864.
  - M. Steyn, WS Boshoff, WC Nienaber, J van der Walt
  - Paper read at the 12th Congress of the Pan-African Archaeological Association for Prehistory and Related Studies 2005
- Field Report on the mitigation measures conducted on the farm Bokfontein, Brits, North West Province .
  - J van der Walt, P Birkholtz, W. Fourie
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2007
- Field report on the mitigation measures employed at Early Farmer sites threatened by development in the Greater Sekhukhune area, Limpopo Province. J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2008
- Ceramic analysis of an Early Iron Age Site with vitrified dung, Limpopo Province South Africa.
  - J van der Walt. Poster presented at SAFA, Frankfurt Germany 2008

- Bantu Speaker Rock Engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga (*In Prep)*
    - J van der Walt and J.P Celliers
- Sterkspruit: Micro-layout of late Iron Age stone walling, Lydenburg, Mpumalanga. W. Fourie and J van der Walt. A Poster presented at the Southern African Association of Archaeologists Biennial Conference 2011
- Detailed mapping of LIA stone-walled settlements' in Lydenburg, Mpumalanga. J van der Walt and J.P Celliers
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Bantu-Speaker Rock engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga. J.P Celliers and J van der Walt
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Pleistocene hominin land use on the western trans-Vaal Highveld ecoregion, South Africa, Jaco van der Walt.
    - J van der Walt. Poster presented at SAFA, Toulouse, France. Biennial Conference 2016

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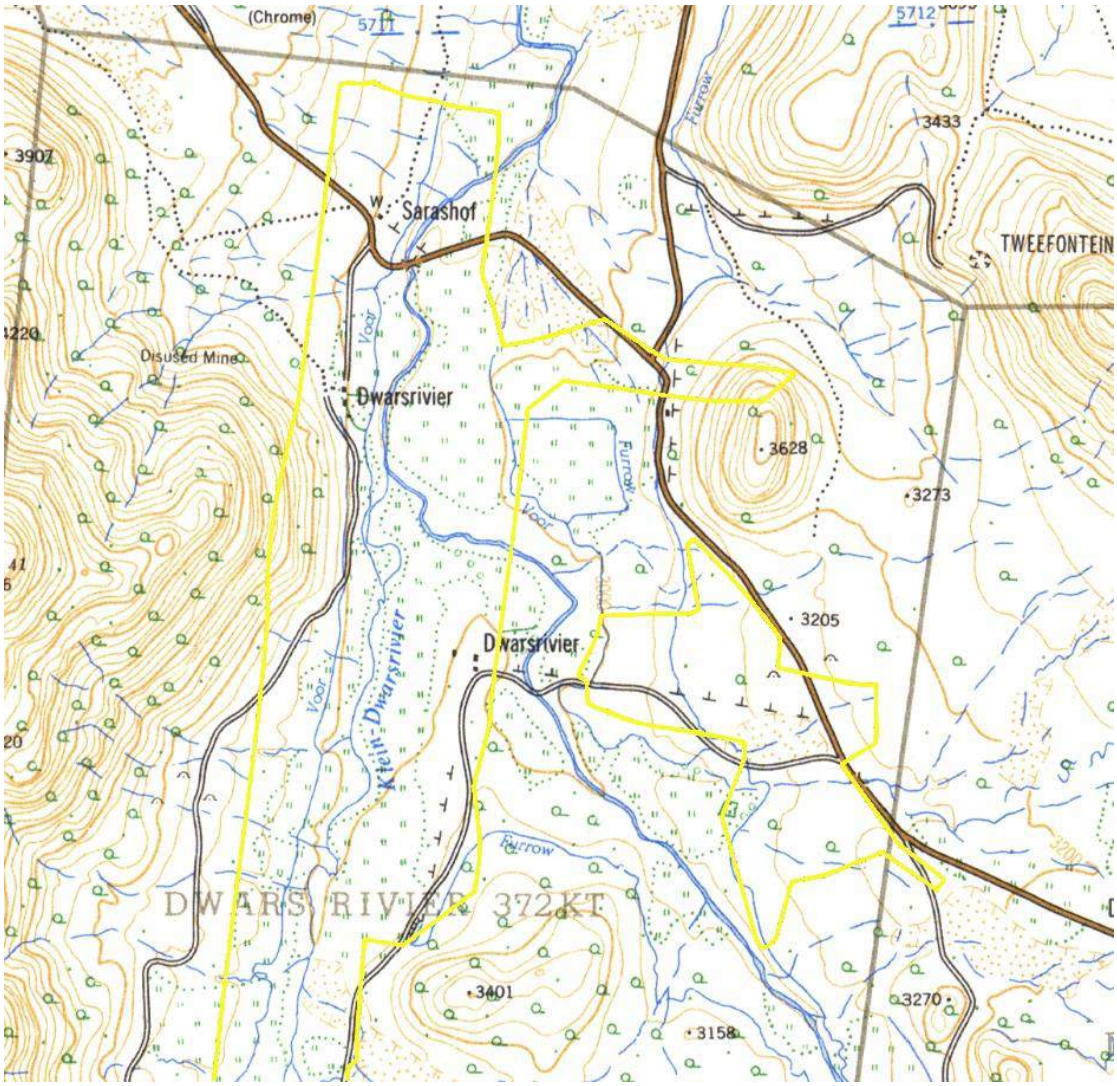
1. Prof Marlize Lombard Senior Lecturer, University of Johannesburg, South Africa
   E-mail: mlombard@uj.ac.za
2. Prof TN Huffman Department of Archaeology Tel: (011) 717 6040
   University of the Witwatersrand
3. Alex Schoeman University of the Witwatersrand
   E-mail:Alex.Schoeman@wits.ac.za

Appendix B

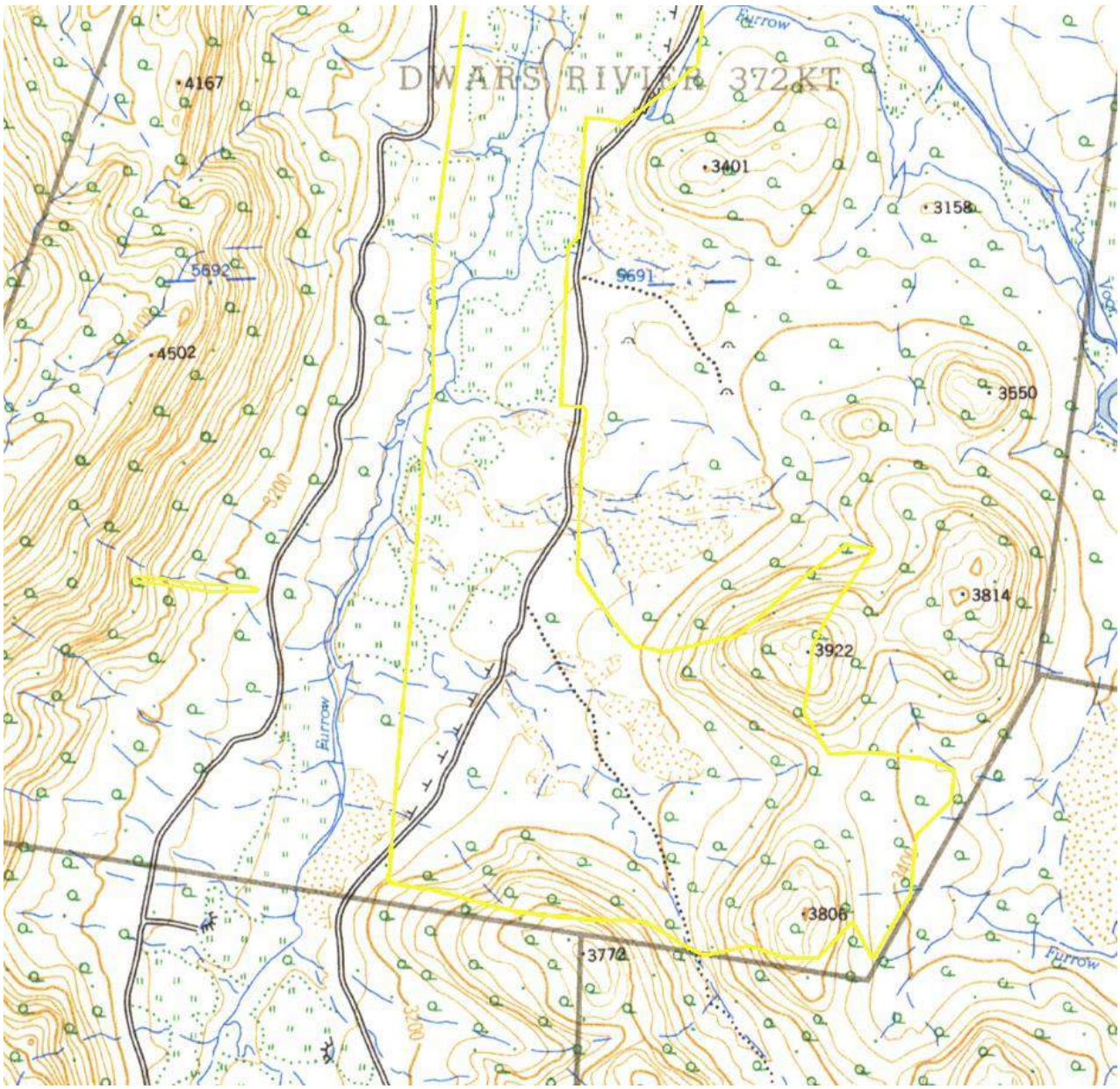
HISTORICAL MAPS:

DWARSRIVIER, LIMPOPO PROVINCE

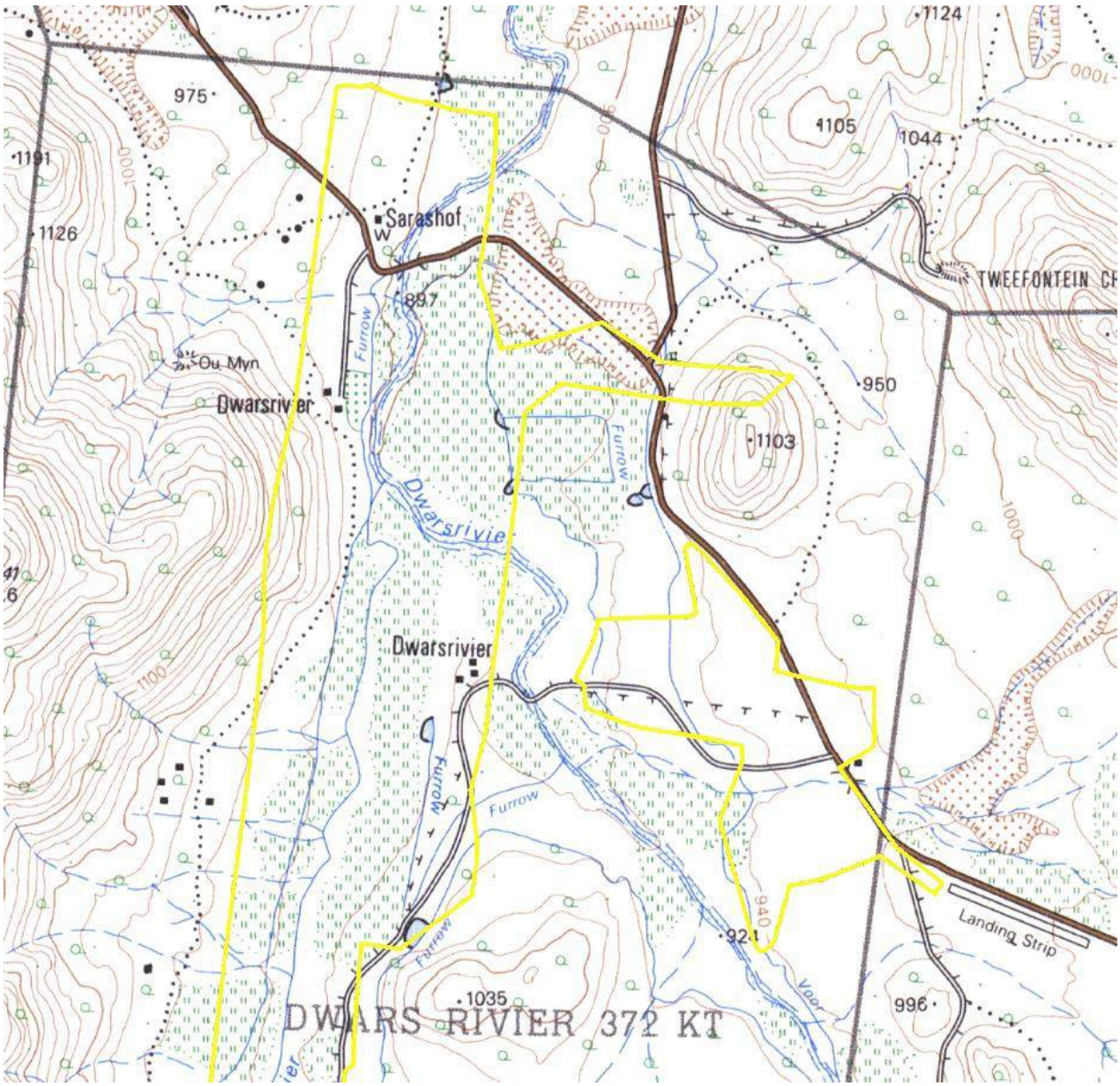
This site is situated about 15 kilometres to the south west of Steelpoort and 35 kilometres to the north west of Lydenburg in Limpopo Province.



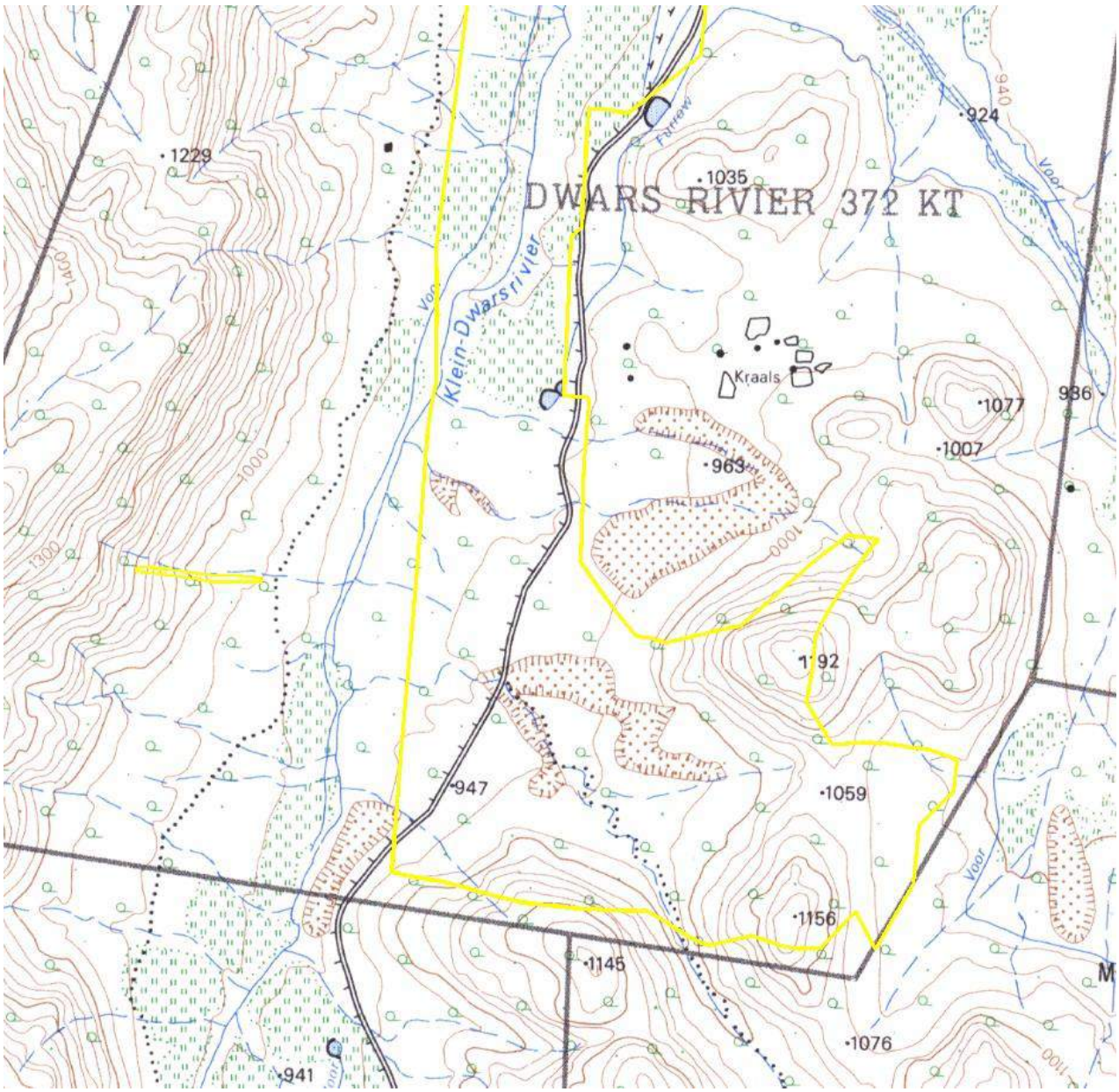
Map 1: 1963 Topographical map of the northern half of the area under investigation. The approximate study area is indicated with a yellow border. One can see that the Klein Dwarsrivier and a number of water furrows went through the north western part of the study area. Large sections of the north western part of the study area were under cultivation, and a secondary road and a number of minor roads went through the area. Near the northern most part of the study area, one can see a track, a shop and a telephone line at “Sarashof”. To the south, three buildings can be seen at “Dwarsrivier”. Three more buildings are visible further to the south east. In the eastern section of land one can see a secondary road and two minor roads, a telephone line, a number of streams, a section of cultivated land and one traditional hut. (Topographical Map 1963)



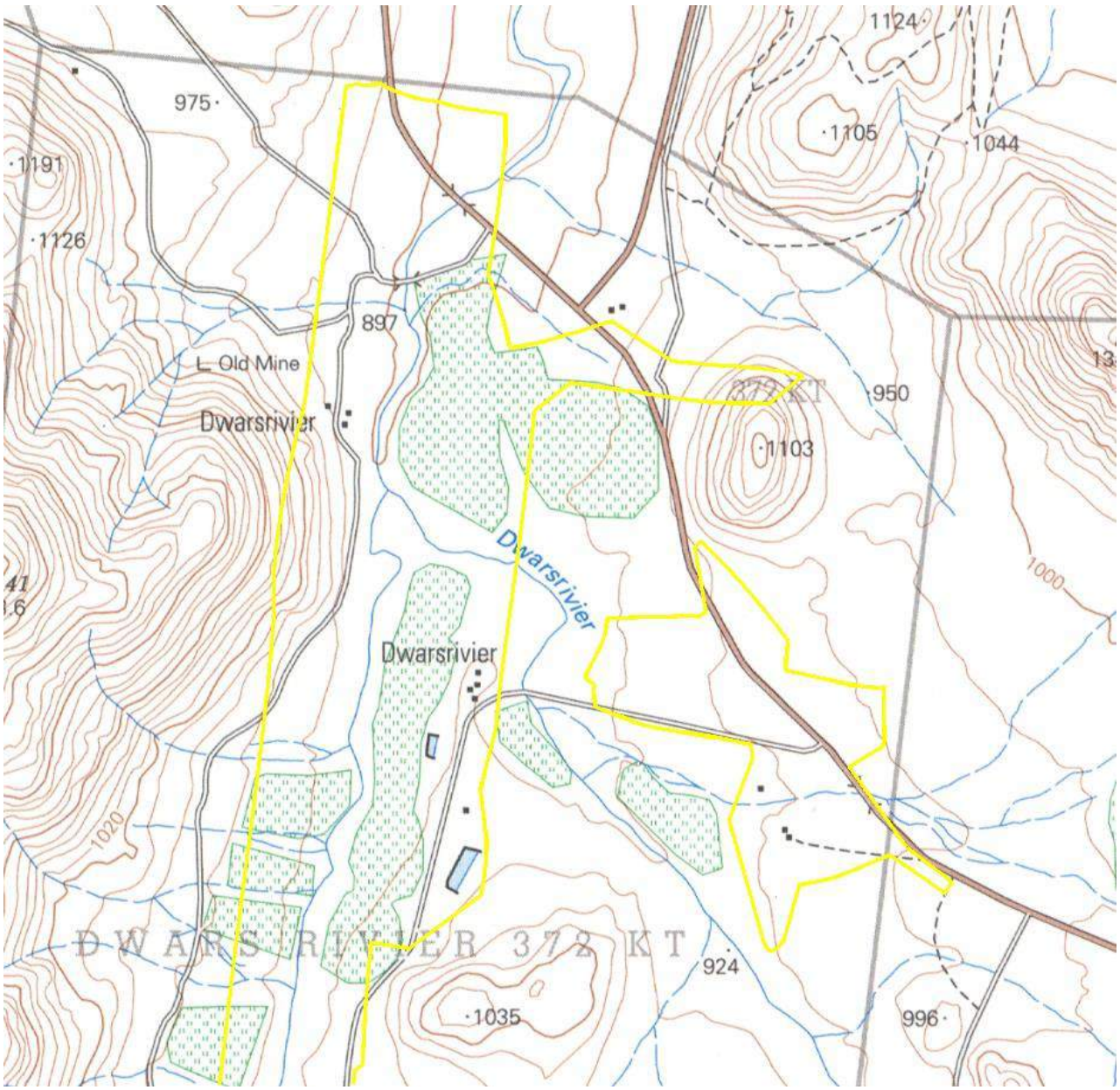
Map 2: 1963 Topographical map of the southern half of the area under investigation. The approximate study area is indicated with a yellow border. A minor road, a track / hiking trail, a telephone line and a number of steams went through the study area. Most of the north western part of the site was under cultivation. One can see natural bush in the more mountainous south eastern part of the property. No buildings are visible. No developments can be seen in the western strip of land. (Topographical Map 1963)



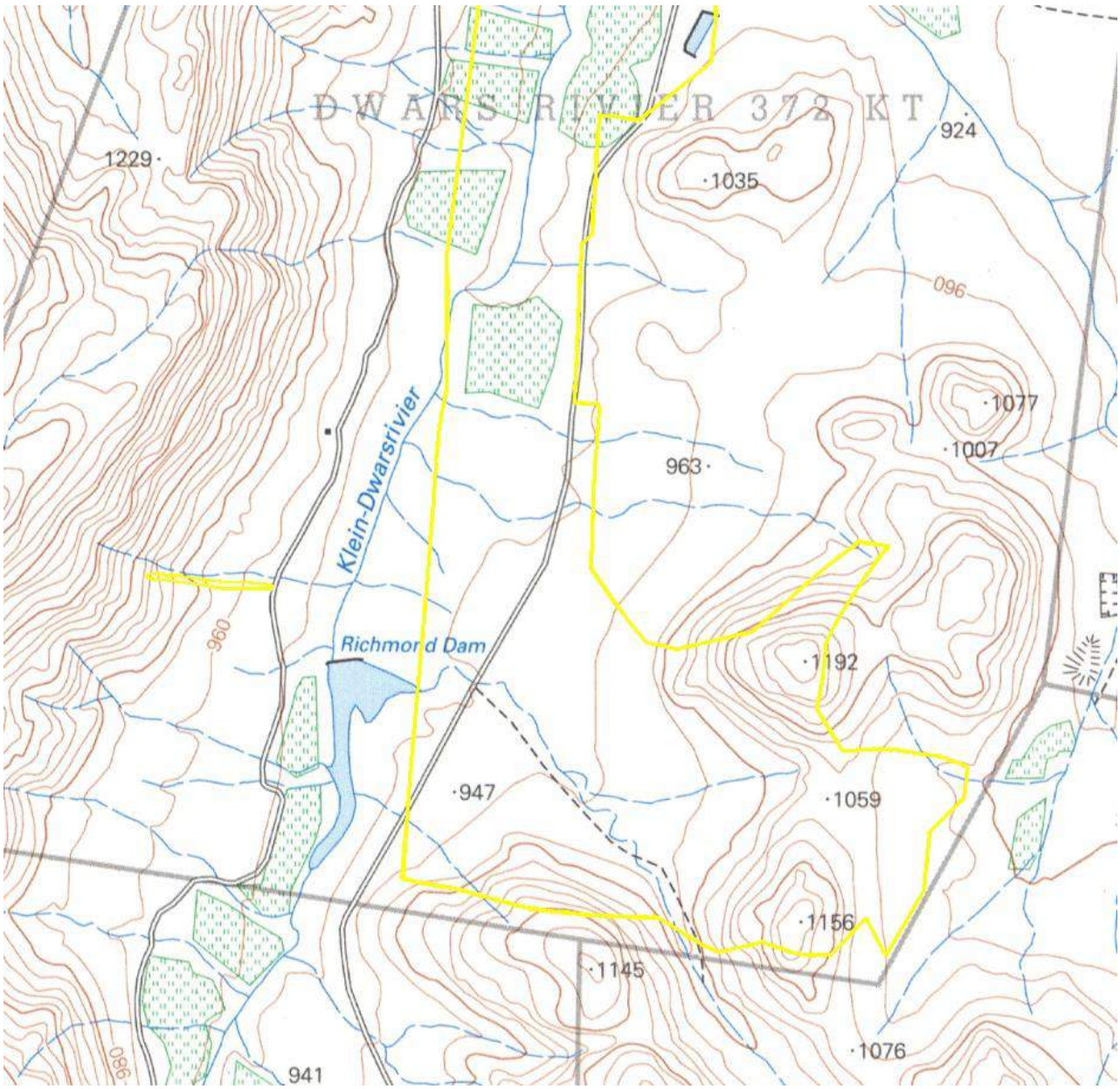
Map 3: 1976 Topographical map of the northern half of the area under investigation. The approximate study area is indicated with a yellow border. One can see that the Klein Dwarsrivier and a number of water furrows went through the north western part of the study area. Large sections of the western part of the study area were under cultivation, and a secondary road and a number of minor roads went through the area. Near the northern most part of the study area, one can see a track / footpath and a shop at "Sarashof". To the south, two buildings and an orchard can be seen at "Dwarsrivier". Three more buildings are visible further to the south east. In the eastern section of land one can see a secondary road and two minor roads, a telephone line, a number of streams and a section of cultivated land. (Topographical Map 1976)



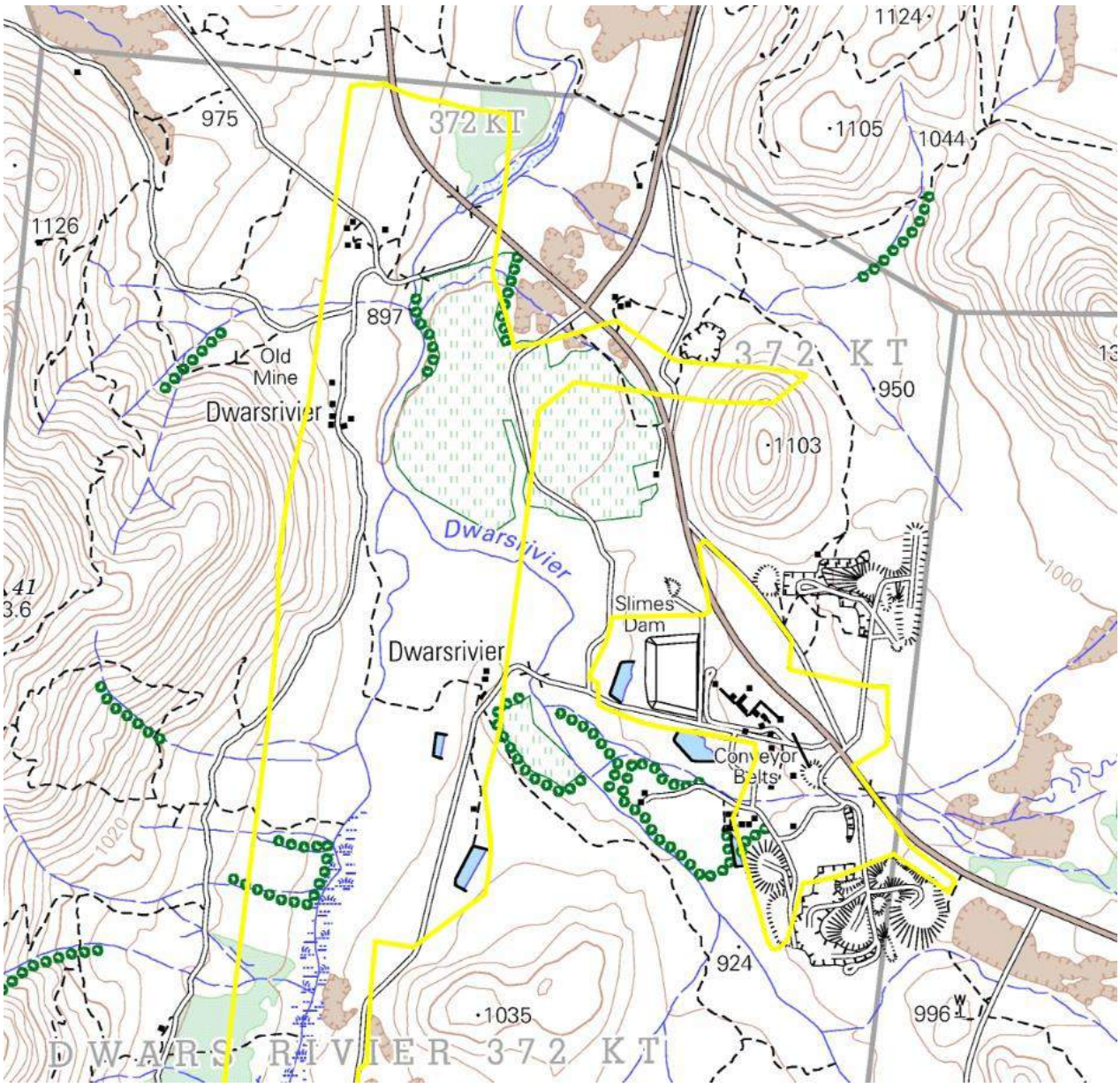
Map 4: 1976 Topographical map of the southern half of the area under investigation. The approximate study area is indicated with a yellow border. A minor road, a track / hiking trail and a number of steams and furrows went through the study area. A north western section of the site was under cultivation. One can see natural bush and two dry pans in the more mountainous south eastern part of the property. No buildings are visible. No developments can be seen in the western strip of land. (Topographical Map 1976)



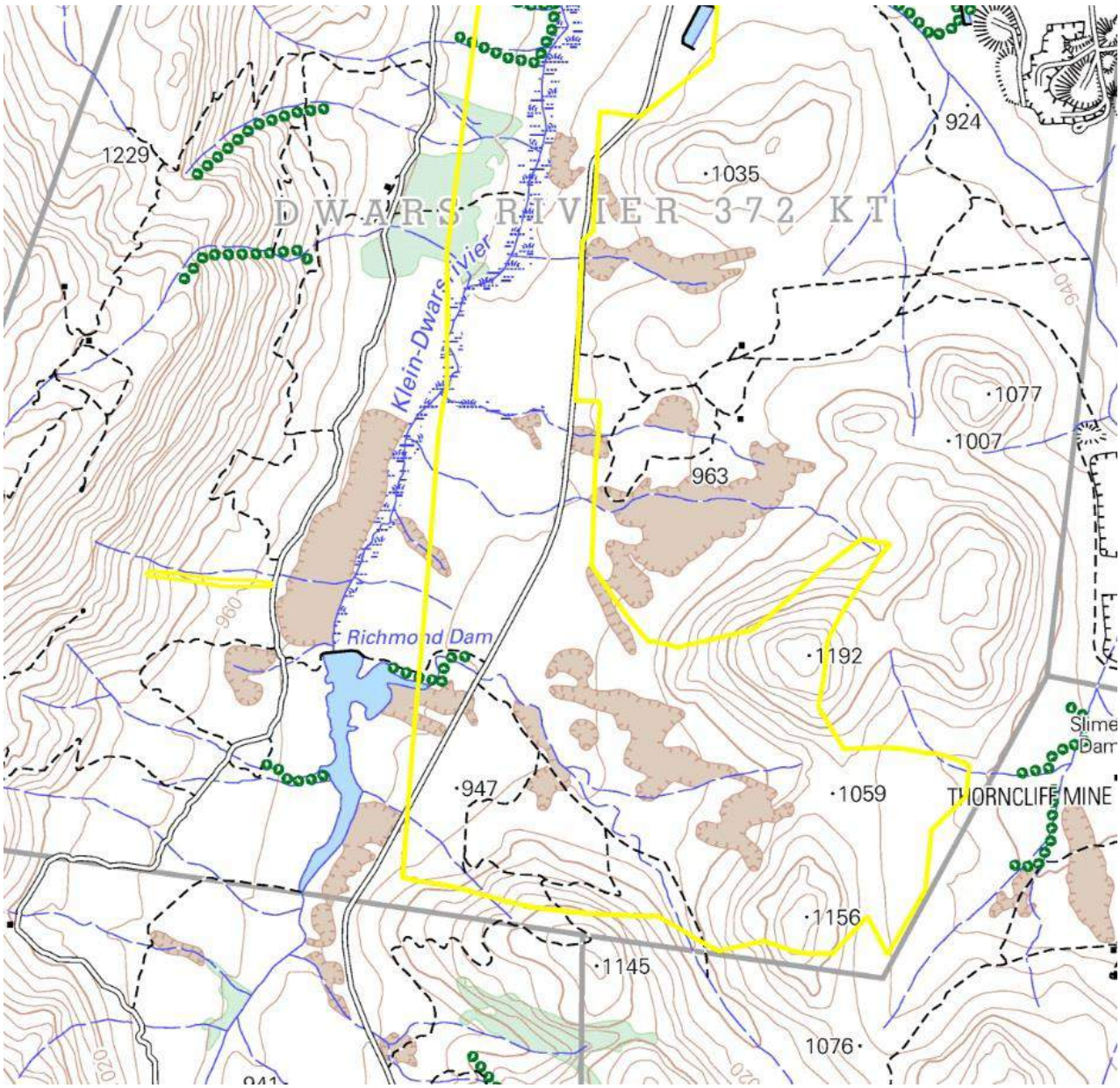
Map 5: 1997 Topographical map of the northern half of the area under investigation. The approximate study area is indicated with a yellow border. One can see that the Dwarsrivier and a number of water furrows went through the north western part of the study area. Large sections of the western part of the study area were under cultivation, and a secondary road and a number of minor roads went through the area. The Sarashof site is no longer visible. To the south, three buildings can be seen at “Dwarsrivier”. Five more buildings and two small dams are visible further to the south east. In the eastern section of land one can see a secondary road and a minor road, a stream, a track / footpath and three buildings. (Topographical Map 1997)



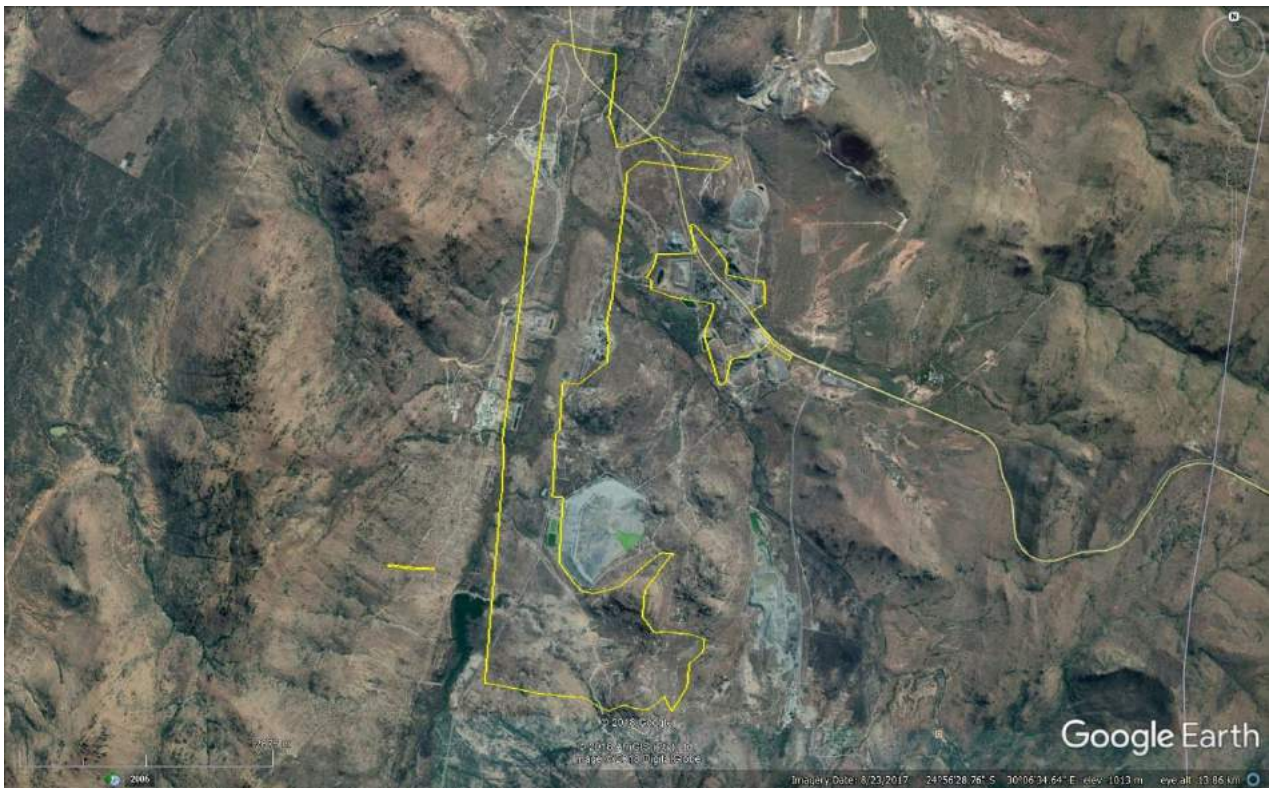
Map 6: 1997 Topographical map of the southern half of the area under investigation. The approximate study area is indicated with a yellow border. A minor road, a track / hiking trail and a number of steams went through the study area. North western sections of the site were under cultivation. No buildings are visible in the study area. The Richmond Dam had been constructed to the west of the area under investigation. No developments can be seen in the western strip of land. (Topographical Map 1997)



Map 7: 2002 Topographical map of the northern half of the area under investigation. The approximate study area is indicated with a yellow border. One can see that the Dwarsrivier and a number of streams went through the north western part of the study area. A marsh / vlei can be seen along the river to the south. One section of land in the northern part of the study area was under cultivation, and a secondary road and a number of minor roads and tracks / footpaths went through the area. Four buildings can be seen in the northern part of the study area. To the south, six buildings can be seen at “Dwarsrivier”. Four more buildings and two small dams are visible further to the south east. In the eastern section of land one can see a number of developments related to mining, including a slimes dam, conveyor belts, a secondary road, minor roads, several buildings, excavations, mine dumps and small dams. (Topographical Map 2002)



Map 8: 2002 Topographical map of the southern half of the area under investigation. The approximate study area is indicated with a yellow border. A minor road, a number of tracks / footpaths, a number of steams and a marsh / vlei went through the study area. A north western section of the site was woodland, and signs of erosion can be seen at various places. No buildings are visible in the study area.. No developments can be seen in the western strip of land. (Topographical Map 2002)



Map 9: 2017 Google Earth image showing the area under investigation. (Google Earth 2017)

Map 10: 2018 Google Earth image showing the study area in relation to Steelpoort, the R555, Lydenburg and other sites. (Google Earth 2018)

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