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A PHASE I HERITAGE IMPACT ASSESSMENT (HIA) STUDY FOR
PALABORA MINING COMPANY'S (PMC) MAIN TAILINGS DAM
NEW EAST PADDOCK IN THE LIMPOPO PROVINCE OF SOUTH
AFRICA

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EXECUTIVE SUMMARY

A Phase I Heritage Impact Assessment (HIA) study as required in terms of Section 38 of the National Heritage Resources Act (No 25 of 1999) was done for Palabora Mining Company's (PMC) main tailings dam east paddock in the Limpopo Province of South Africa. The aims with the HIA study were to establish if any of the types and ranges of heritage resources (the 'national estate') as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) do occur in the proposed new east paddock area (Project Area) (see Box 1).

The Phase I HIA study for the proposed new east paddock revealed the following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) in the Project Area, namely:

- A copper reduction furnace which probably dates from the Late Iron Age near the middle of the paddock area.

The copper reduction furnace was geo-referenced and mapped. The furnace's level of significance was also determined and mitigation measures for the furnace have been proposed (Figure 3, Table1).

Heritage resources occur close to the paddock but are located in the peripheral area where they will not be affected by the development of the east paddock. These remains are consequently not further discussed.

The copper reduction furnace will be covered and therefore destroyed by the proposed new east paddock. The copper reduction furnace has high significance when considering criteria such as the following:

- Very few iron or copper reduction furnaces still exist in the Phalaborwa area.
- It appears as if the furnace is still in a good condition.
- The furnace has research value as it can reveal information about copper reduction furnaces' appearance; the way these furnaces were operated; what metallurgical processes were applied when the furnace were operational in the past, etc. (The latter aspects can also be reconstructed by means of analysing

slags, ores, blowpipe fragments and other metal working debris which occur in context with the furnace).

- It may be possible to remove the furnace intact so that it can be preserved in a local museum.

✓ The copper reduction furnace must be mitigated by means of an excavation in order to retrieve the furnace. The furnace can only be excavated after the Limpopo Provincial Heritage Resources Authority (LHRA) has issued a permit which would authorise the excavation of the furnace. An archaeologist accredited with ASAPA must apply for this permit.

✓ A brief report outlining the mitigation of the furnace must be prepared for SAHRA. If the furnace can be retrieved in a near unaffected condition it can be donated to a local museum.

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1 INTRODUCTION

This document contains the report on the results of a Phase I Heritage Impact Assessment (HIA) study done for Palabora Mining Company's (PMC) main tailings dam new east paddock in Phalaborwa in the Limpopo Province of South Africa (hereafter referred to as the Project Area). Focused archaeological research conducted in this province for more than four decades has indicated that various types and ranges of heritage resources that qualify as part of South Africa's 'national estate' occur in the Limpopo Province (see Box 1, next page).

PMC's premises have been subjected to heritage surveys in the past (See 'Select Bibliography', Part 8). Nevertheless, Section 38 of the National Heritage Resources Act (No 25 of 1999) requires that any new development such as PMC's main tailings dam new east paddock should be subjected to a Phase I Heritage Impact Assessment (HIA).

Box 1: Types and ranges of heritage resources that qualify as part of the 'national estate' as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999).

The National Heritage Resources Act (Act No 25 of 1999, Section 3) outlines the following types and ranges of heritage resources that qualify as part of the national estate, namely:

- (a) places, buildings structures and equipment of cultural significance;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features of cultural significance;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and paleontological sites;
- (g) graves and burial grounds including-
 - (i) ancestral graves;
 - (ii) royal graves and graves of traditional leaders
 - (iii) graves of victims of conflict
- (w) graves of individuals designated by the Minister by notice in the Gazette;
- (v) historical graves and cemeteries; and
- (vi) other human remains which are not covered by in terms of the Human Tissue Act, 1983 (Act No 65 of 1983)

- (h) sites of significance relating to the history of slavery in South Africa:
 - (i) moveable objects, including -
 - (i) objects recovered from the soil or waters of South Africa, including archaeological and paleontological objects and material, meteorites and rare geological specimens;
 - (ii) objects to which oral traditions are attached or which are associated with living heritage;
 - (iii) ethnographic art and objects;
 - (iv) military objects;
 - (v) objects of decorative or fine art;
 - (vi) objects of scientific or technological interest; and
 - (vii) books, records, documents, photographs, positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No 43 of 1996).

The National Heritage Resources Act (Act No 25 of 1999, Art 3) also 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 the following:

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

2 TERMS OF REFERENCE

Palabora Mining Company (PMC) intends to construct a new east paddock for its existing main tailings dam. Consequently, PMC and Golder Associates commissioned the author to undertake a Phase I HIA study for the proposed new east paddock for the main tailings dam. The aims with the Phase I HIA are the following:

- to establish whether any of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) (see Box 1) do occur within the perimeters of the Project Area and, if so;
- to determine the level of significance of these heritage resources;
- to establish if any impact may occur on these heritage resources and, if so;
- to make recommendations regarding the mitigation or the conservation of these heritage resources if they are to be affected by the new development.

3 THE PROJECT AREA

3.1 Location

PMC is located in Phalaborwa in the Lowveld of the Limpopo Province of South Africa. The mine premises is caught between the Olifants River in the south, the Kruger National Park in the east, Foskor in the west and the southern boundary of the town of Phalaborwa in the north. The new east paddock is situated above, or to north of the Olifants River and near PMC's eastern boundary with the Kruger National Park. Known Late Iron Age sites located in close proximity of the Project Area include the hills of Phutwane and Driekop. The proposed new east paddock and associated return water dam will cover a surface of approximately 40 hectares (2331CC Phalaborwa and 2431AA Grietjie 1:50 000) (Figure 1).

3.2 Within a cultural landscape

PMC is located in the midst of a cultural landscape that is marked by extensive remains that date from the Iron Age. These heritage sites are associated with pre-historical and historical mining and metal working remains. Stone Age sites that are associated with stone tools also occur in the Phalaborwa region but not in such large numbers as sites dating from the Iron Age. No rock art sites occur within PMC's boundaries while mining heritage remains dating from the turn of the 19th century and from the early 20th century do occur within the boundaries of PMC and its neighbour, namely Foskor. The archaeological and historical significance of this cultural landscape therefore must be described and explained in more detail before the results of the Phase I HIA study is discussed (see Parts 5 & 8).

3.3 The nature of the Project Area

The proposed new east paddock and a small associated (east) return water dam will be constructed along the eastern side of PMC's main tailings dam. The new

paddock will run from the north to the south along the existing main tailings dam and the associated return water dam slightly further to the east. This infrastructure will cover a surface of approximately 40 hectares.

The Project Area is relatively pristine except for a piece of land which is cover with water and which serves as the outlet for the main tailings dam. A few dirt roads also criss-cross the Project Area.



Figure 1- The Project Area where the proposed new east paddock will be developed between PMC's existing main tailings dam and the Kruger National Park (KNP) in the east. Note the outlet for the main tailings dam. Tshikumbu, Massorini and Vhudogwa kopjes with archaeological remains can be seen in the KNP in the far background (above).

4 METHODOLOGY

4.1 Method

This survey was conducted by means of consulting archaeological data bases; doing a survey on foot of the project area; studying maps of the project area and by means of utilizing evidence derived from previous surveys and excavations done by the author in the Phalaborwa region during the past two decades.

Archaeological data bases kept at institutions such as African Window and the South African Heritage Resources Authority (SAHRA) (Cape Town [national] and Polokwane [provincial]) was consulted to establish if any heritage resources of significance occur in or near the Project Area.

Only selected spots in the Project Area were surveyed on foot as parts of the new proposed tailings dam area were surveyed on foot in the past.

The 1 : 50 000 and 1 : 250 000 maps were also used to study the Project Area.

Large areas in Phalaborwa and in PMC's premises have been surveyed by the author in the past. Approximately 53 Iron Age sites have been mapped and recorded while at least eleven sites have been excavated (See Part 8, 'Select Bibliography').

4.2 Assumptions and limitations

It is possible that this Phase I HIA study may have missed heritage resources in the Project Area as heritage sites may occur in thick clumps of vegetation while others may lie below the surface of the earth and may only be exposed once development commences.

4.3 Chance finds

If any heritage resources of significance is exposed during the construction project the South African Heritage Resources Authority (ASAPA) should be notified immediately, all construction activities must be seized and an archaeologist accredited with the Association for Southern African Professional Archaeologist (ASAPA) should be notify in order to determine appropriate mitigation measures for the discovered finds. This may include obtaining the necessary authorisation (permits) from SAHRA to conduct the mitigation measures.

4.4 Some remarks on terminology

Terminology that may be used in this report is outlined in Box 2 (below, next page).

Box 2. Terminologies that may be used in this report

The Heritage Impact Assessment (HIA) referred to in the title of this report includes a survey of heritage resources as outlined in the National Heritage Resources Act (Act 25 of 1999) (See Box 1).

Heritage resources (cultural resources) include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The term 'pre-historical' refers to the time before any historical documents were written or any written language developed in a particular area or region of the world. The historical period and historical remains refer, for the project area, to the first appearance or use of 'modern' Western writing brought to the Phalaborwa area by the first Colonists who settled in this area during the early 1900's.

The term 'relatively recent past' refers to the 20th century. Remains from this period are not necessarily older than sixty years and therefore may not qualify as archaeological or historical remains. Some of these remains, however, may be close to sixty years of age and may, in the near future, qualify as heritage resources.

It is not always possible, based on observations alone, to distinguish clearly between archaeological remains and historical remains, or between historical remains and remains from the relatively recent past. Although certain criteria may help to make this distinction possible, these criteria are not always present, or, when they are present, they are not always clear enough to interpret with great accuracy. Criteria such as square floor plans (a historical feature) may serve as a guideline. However, circular and square floors may occur together on the same site.

The term 'sensitive remains' is sometimes used to distinguish graves and cemeteries as well as ideologically significant features such as holy mountains, initiation sites or other sacred places. Graves in particular are not necessarily heritage resources if they date from the recent past and do not have head stones that are older than sixty years. The distinction between 'formal' and 'informal' graves in most instances also refers to graveyards that were used by colonists and by indigenous people. This distinction may be important as different cultural groups may uphold different traditions and values with regard to their ancestors. These values have to be recognised and honoured whenever graveyards are exhumed and relocated.

The term 'Stone Age' refers to the prehistoric past, although Late Stone Age peoples lived in South Africa well into the historical period. The Stone Age is divided into an Earlier Stone Age (3 million years to 150 000 thousand years ago) the Middle Stone Age (150 000 years to 40 000 years ago) and the Late Stone Age (40 000 years to 200 years ago).

The term 'Iron Age' refers to the last two millennia and 'Early Iron Age' to the first thousand years AD. 'Late Iron Age' refers to the period between the 16th century and the 19th century and can therefore include the historical period.

Mining heritage sites refer to old, abandoned mining activities, underground or on the surface, which may date from the pre-historical, historical or the relatively recent past.

The term 'study area', or 'project area' refers to the area where the developer wants to focus its development activities.

Phase I studies refer to surveys using various sources of data in order to establish the presence of all possible types of heritage resource in any given area.

Phase II studies include in-depth cultural heritage studies such as archaeological mapping, excavating and sometimes laboratory work. Phase II work may include the documenting of rock art, engraving or historical sites and dwellings; the sampling of archaeological sites or shipwrecks; extended excavations of archaeological sites; the exhumation of bodies and the relocation of graveyards, etc. Phase II work may require the input of specialists and requires the co-operation and approval of SAHRA.

5 CONTEXTUALISING THE PROJECT AREA

The following brief overview of pre-historical, historical, cultural and economic evidence will help to contextualise the Project Area.

5.1 Stone Age sites

Stone Age sites are marked by stone artefacts that are found scattered on the surface of the earth or as parts of deposits in caves and rock shelters. The Stone Age is divided into the ~~Early Stone Age~~ (covers the period from 2.5 million years ago to 250 000 years ago), the Middle Stone Age (refers to the period from 250 000 years ago to 22 000 years ago) and the ~~Late Stone Age~~ (the period from 22 000 years ago to 2 000 years ago).

Earlier
later

These Stone Ages can be divided into different 'cultural' periods, each of which is characterised by specific hominids, artefact types and lifestyles. These cultural periods existed under different climatic conditions and did not necessarily cover the same time periods in different regions of South Africa.

Heritage surveys up to now have revealed few Stone Age sites in the Phalaborwa region, primarily as a result of the fact that these surveys did not focus on the recording of Stone Age sites. It can be expected that all the phases of the Stone Age will be present in the Phalaborwa area. Archaeological surveys and excavations conducted by the University of Pretoria in the Kruger National Park during the 1970's and 1980's has indicated that this part of the Lowveld holds many Middle Stone Age and Late Stone Age sites.

The Late Stone Age is also associated with rock paintings and engravings which were done by the San, Xhosi and in more recent times by Negroid (Iron Age)

farmers. Rock paintings as well as rock engravings do occur in the Kruger National Park, to the east of PMC.

5.2 Iron Age remains

The Iron Age is associated with the first Bantu-Negroid agro-pastoralists who lived in semi-permanent villages and who practised metal working during the last two millennia. The Iron Age is usually divided into the Early Iron Age (covers the 1st millennium AD) and the Later Iron Age (covers the first 880 years of the 2nd millennium AD).

The Phalaborwa region was occupied by metalworking communities during at least two periods in the last 1 200 years. Both phases of occupation (the 9th-13th and 17th-20th centuries) coincided with trade along the East Coast of Africa. Very little is known about the early phase of metal [copper] working. There is a strong possibility that the metal trade was, initially at least, geared to address the needs of local communities rather than to cater for traders from elsewhere.

West of Phalaborwa, in the fertile foothills of the Drakensberg, eastern Sotho clans such as the Lobedu, Kgaga, Nareng and Koni led a predominantly agricultural existence. Physiographic and climatic differences between the tropical foothills of the Drakensberg and the dry, barren Lowveld further east supported a process of cultural ecological symbiosis (short-distance trade) between the Drakensberg agriculturists and the Lowveld metal workers. Iron tools vital for agriculture was traded for crop plants, which could not be produced in Phalaborwa.

Long-distance trade between the South African interior and the East Coast, which started as early as the 8th century AD, expanded in the 16th century, when Europeans entered the Indian Ocean trade network. Phalaborwa became one of the hubs of the short- and long-distance trade networks. Different groups

controlled the manufacture and trade of metals: the most dominant spheres of influence in Phalaborwa were those of the Makušane-Malaŋi and the Masêkê-Malaŋi. Later, in the 19th century, the domains dominated by the Šai (in the Mašišimale Hills) and the Majaji-Malaŋi (in what is now the Kruger National Park), to the south and to the east of Phalaborwa, rose to prominence.

Approximately 53 metal working sites, the majority associated with the syenite hills that stud the area, are dotted around the landscape in the present-day Phalaborwa region. The settlement style of the metal workers indicates a geographical separation of primary (ore smelting) and secondary (iron forging and copper melting and forging) metalworking activities. The metal workers and their families lived on terraces located against the slopes of hills and on level ground, but iron and copper smelting furnaces were located some distance from these living quarters. Iron forge furnaces with massive anvil stones on which iron bloom were forged were built on terraces against the slopes of the hills or on level ground, mostly close to where the people lived.

This pattern is consistent with an ideology in which smelting was practised with ritual and was associated with many taboos. Smelting was done away from villages, so that menopausal women could not attend or interfere with these activities. Medicine holes in iron-smelting furnaces and certain iron forge furnaces served as receptacles for 'medicine', such as human hand bones. Other possible 'medicines' include remains from the aardvark, lions and neonatal sheep. Some of these medicines were used to propitiate the forefathers to ensure a successful smelt.

The geographical separation of smelters' working areas from the residential areas may indicate that 'smelters were married to their furnaces' during smelting periods and consequently abstained from sexual intercourse with women during times of iron and copper smelting. The metalworking process was also regarded as a metaphor for human sexual intercourse, fertility and fecundity. Metal working

eventually became entrenched in the political, social and religious and other aspects of the lives of the metal workers.

Iron and copper ores were smelted in various types of clay furnaces loaded with ores, charcoal and fluxes such as quartzite stone, bones and mollusc shells. The smelters operated clay bellows (*tyeres*). The end of the blowpipe was placed into openings in the furnace while the other end was attached to leather bellows. Air produced in the bellows was blown (pushed) into the furnaces through the blowpipes.

Two processes were used to manufacture iron and copper, namely the smelting (reduction) of the iron and copper ores and the refining of the manufactured iron bloom and the solidified copper (ingots). Iron bloom was transformed into artefacts such as iron hoes, axes, spearheads and adzes. The reworking of copper (ingots) consisted of the melting and casting of copper; cold or hot forging of copper; or copper wire drawing. Copper was mostly used for jewellery such as arm bangles, wire, beads, etc.

The metalworking industry in Phalaborwa declined during the last quarter of the 19th century. After Sochangaan had subjugated the Tsonga in Mocimboa during the 1840's, access to harbours such as Delagoa Bay and Inhambane, from where some of Phalaborwa's metal work entered the Indian Ocean trade network was restricted. European manufactured iron goods, including iron hoes, were imported into the Lowveld causing a decline in the demand for these implements. Oral tradition also indicates that internal strife between the various metal working domains in Phalaborwa, exacerbated by the influx of Changaan groups from Mocimboa and the interference of influential trader groups that established new alliances with the local metal working domains increased.

5.3 The historical period

Phalaborwa's ancient metalworking industry died during the last decades of the 19th century. Remnants of metalworking groups were removed and resettled in the townships – that still exist around the town of Phalaborwa today – during the early 20th century. The first European prospectors entered the area during the first decades of the 20th century.

The first commercial mining enterprise in the area was the Guide copper mine in 1904, but transport difficulties soon put the mine out of business. In 1938 a start was made with the mining of vermiculite from the world's largest known ore body. The real mining thrust, however, came after Foskor was formed in 1951 to mine phosphate in order to manufacture fertilisers. Copper extraction from carbonatite began in earnest in 1965. The farm Laaste was bought in order to establish a town for the mineworkers. Phalaborwa received municipal status during the 1950's.

6 THE PHASE I HERITAGE IMPACT ASSESSMENT STUDY

6.1 Heritage resources in the Project Area

The Phase I HIA study for the proposed new east paddock revealed the following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) in the Project Area, namely:

- A copper reduction furnace which probably dates from the Late Iron Age near the middle of the paddock area.

The copper reduction furnace was geo-referenced and mapped. The furnace's level of significance was also determined and mitigation measures for the furnace have been proposed (Figure 3, Table1).

6.2 Heritage resources outside the Project Area

Heritage resources occur close to the paddock but are located in the peripheral area where they will not be affected by the development of the east paddock.

These remains are consequently not further discussed. Only Phutwane, one of the settlements close to the Project Area, is illuminated with a photograph.

No on map	Copper furnace	reduction shaped	Coordinates	Level of significance	Magnitude of impact
	Horse-shoe furnace, single portal		24° 00.030' 31° 11.644'	HIGH	HIGH

Table 1 - Coordinates for a copper reduction furnace near the middle of the east paddock for PMC's main tailings dam. Note its level of significance as well as the magnitude of impact on this feature (above).

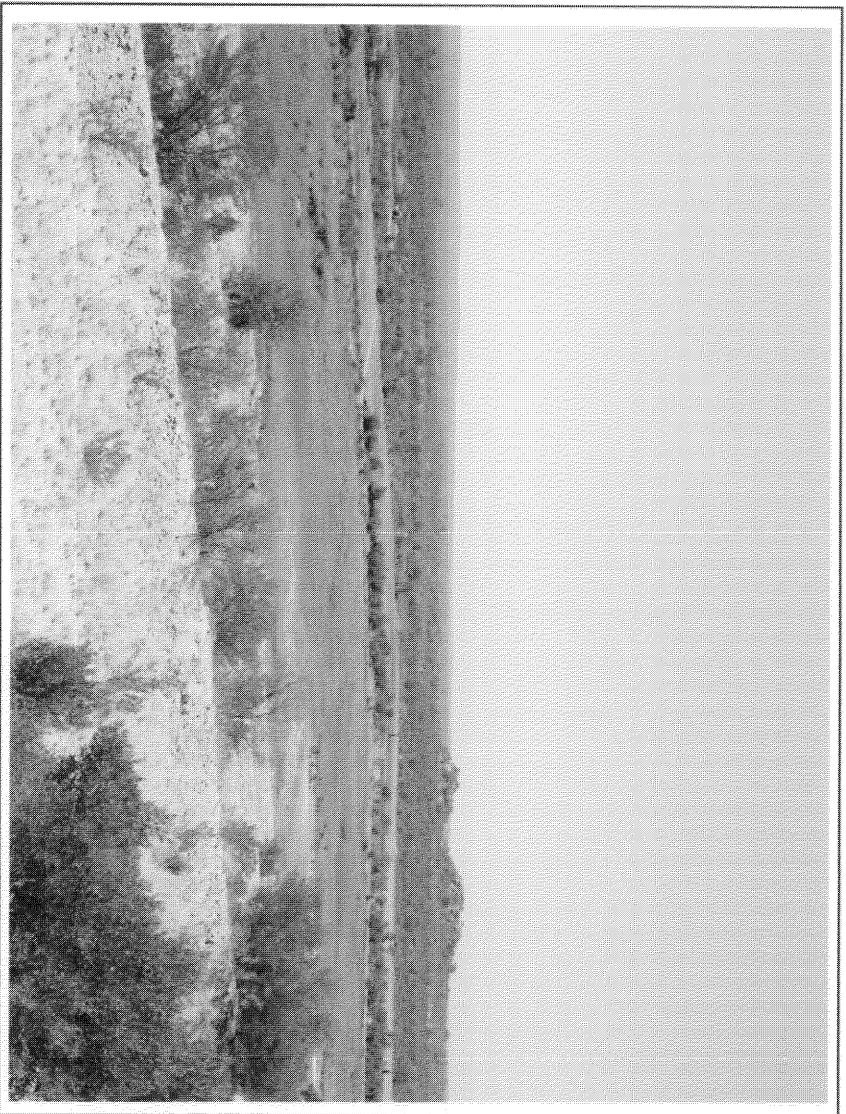


Figure 2- Phutwane, a settlement that was occupied by a metal working group during the Late Iron Age (far background). This site occurs in the peripheral area near the east paddock. This site together with other sites outside the Project Area will not be affected by the proposed development project (above).

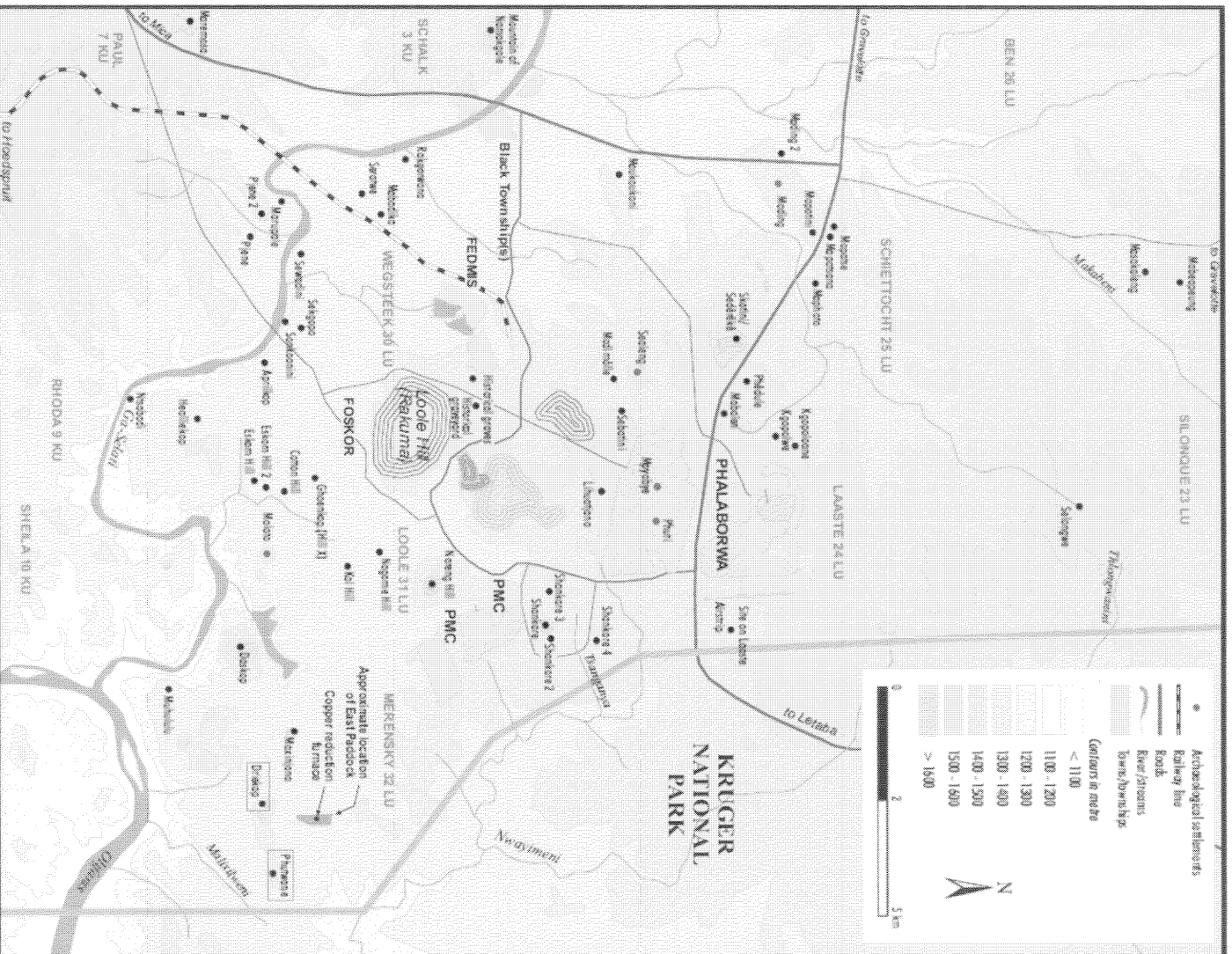


FIG 3 The construction of the proposed new east paddock for Phalabora Mining Company's existing main tailings dam in the Limpopo Province of South Africa; note the presence of a copper reduction furnace near the middle of the proposed new east paddock. Residential terraces occur along the slope of Driekop some distance to the south-east of the Project Area. Late Iron Age sites such as Muhlulu and Phuthwane also occur in the peripheral area where these sites will not be affected by the proposed new development project.

6.3 The copper reduction furnace in the Project Area

The rim of a possible copper reduction furnace was exposed near the middle of the proposed new paddock where a dirt road was constructed some time ago. The grader which was used to clear the road exposed the top of the furnace when the overburden was removed. Other surface disturbance activities around the furnace may have destroyed residential remains which may have been part of a larger site incorporating the furnace.

Various types of copper and iron reduction furnaces were used by the metal workers of Phalaborwa. The horse-shoe shape of the rim of the furnace which has been exposed suggests that this furnace was used for the reduction (smelting) of copper.



Figure 5- The top (rim) of a copper reduction furnace near the middle of the paddock area was exposed when a grader was used to build a dirt road (above).

6.3.1 The significance of the copper reduction furnace

The copper reduction furnace will be covered and therefore destroyed by the proposed new east paddock. The significance of this structure therefore has to be determined.

The copper reduction furnace has high significance when considering criteria such as the following:

- Very few iron or copper reduction furnaces still exist in the Phalaborwa area.
- It appears as if the furnace is still in a good condition.
- The furnace has research value as it can reveal information about copper reduction furnaces' appearance; the way these furnaces were operated; what metallurgical processes were applied when the furnace were operational in the past, etc. (The latter aspects can also be reconstructed by means of analysing slags, ores, blowpipe fragments and other metal working debris which occur in context with the furnace).
- It may be possible to remove the furnace in tact so that it can be preserved in a local museum.

6.3.2 Mitigating the copper reduction furnace

The copper reduction furnace must be mitigated by means of an excavation in order to retrieve the furnace. The furnace can only be excavated after the Limpopo Provincial Heritage Resources Authority (LIHRA) has issued a permit which would authorise the excavation of the furnace. An archaeologist accredited with ASAPA must apply for this permit.

A brief report outlining the mitigation of the furnace must be prepared for SAHRA. If the furnace can be retrieved in a near unaffected condition it can be donated to a local museum.

7 CONCLUSION AND RECOMMENDATIONS

The Phase I HIA study for the proposed new east paddock revealed the following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) in the Project Area, namely:

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A brief report outlining the mitigation of the furnace must be prepared for SAHRA. If the furnace can be retrieved in a near unaffected condition it can be donated to a local museum.

A handwritten signature in black ink, appearing to read 'Julius CC Pistorius', written in a cursive style.

DR JULIUS CC PISTORIUS
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Series of pamphlets compiled by JCC Pistorius and the Palabora Heritage

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- The Metal workers of Phalaborwa.*
- Metal working in Phalaborwa.*
- Metal workers and trade in Phalaborwa.*
- The Makušane and Masêkê-Malajji spheres of influence in Phalaborwa.*