HWC Case No. 6103109AS1128E

HERITAGE IMPACT ASSESSMENT

Proposed Extension of Dolomitic Limestone Mine and Construction of Lime Kilns on Farm Welverdiend No. 511, Vanrhynsdorp, Matzikama Municipality Western Cape

Assessment conducted under Section 38 (3) of the National Heritage Resource Act (No. 25 of 1999

Applicant:

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MAY 2017

1. Executive summary

1. Introduction

ACRM was appointed by Afrimat Aggregates (Pty) Ltd to conduct a Heritage Impact Assessment (HIA) for a proposed dolomitic limestone mine, and construction of lime kilns on the the Remainder of the Farm Welverdiend No. 511, located 8kms south west of Vanrhynsdorp in the Western Cape.

2. The development proposal

Proposed mining entails the clearing of ± 40ha of undeveloped land for the purposes of mining limestone deposits, as well as the construction of a crushing plant, four fluid bed lime calciners and associated support services.

The layout of the plant area will be planned to allow the phasing in of the four kilns to the process line, as and when required. It will also include associated logistical facilities, workshops and an office complex.

Access roads to the facility will be extended from the existing tarred access road from the N7.

The total footprint area of the mining development will be ± 34ha.

The process plant and logistical facilities will have a maximum footprint area of ± 10ha.

A HIA, comprising an archaeological and palaeontological study was requested by Heritage Western Cape (HWC), following the submission of a Notice of Intent to Develop (NID).

HWC also requested that comments from registered conservation bodies and the local municipality must also be included in the final HIA report, which forms part of an Environmental Impact Assessment (EIA) process.

ACRM was subsequently appointed to undertake the specialist archaeological study and write up the integrated HIA report.

Dr John Almond was commissioned to undertake the specialist palaeontological study (or PIA).

3. Aim of the HIA

The overall purpose of the HIA is to assess the sensitivity of archaeological and palaeontological resources in the proposed development site (i.e. the Mine and Plant Area), to determine the potential impacts on such resources, and to avoid and/or minimise such impacts by means of management and/or mitigation measures.

The significance of archaeological resources was assessed in terms of their content and context. Attributes considered in determining significance include artefact and/or ecofact types, rarity of finds, exceptional items, organic preservation, potential for future research, density of finds and the context in which archaeological traces occur.

4. Results of the HIA

4.1 Archaeology

Large numbers of stone implements were recorded in both the footprint area of the proposed Mine Area, as well as in the footprint area of the proposed Plant Area. The remains, however, are spread quite thinly and unevenly over the surrounding landscape.

Most of the tools occur on compact red Pleistocene sands, where the top soils have been washed or eroded away, indicating that more tools most likely occur below the superficial surface deposits. Tools were also noted in disturbed areas such as old farm roads, along fence lines and in animal tracks.

The archaeologist Jayson Orton (pers. comm. 2013) has suggested that much of the Knersvlakte region around Vanryhnsdorp is covered by a thin layer of stone artefacts whose distribution is partly the result of erosive forces. The occurrences documented simply being surfaces revealed by erosion, rather than actual occupation sites.

Archaeological resources in the proposed Plant Area are associated with heuweltjies that are dotted around the footprint area. Areas surrounding heuweltjies are usually quite eroded and denuded of vegetation. Tools, including irregular cores, unmodified flakes, large flaked chunks, flake debris, anvils and hammerstones indicate possible activity/stone knapping areas.

It is estimated that more than 95% of the stone tools recorded during the study are assigned to the Middle Stone Age (MSA), while limited numbers of Early Stone Age (ESA) and Later Stone Age (LSA) tools were found. No organic remains such as ostrich eggshell or pottery were found.

More than 90% of the tools recorded are in a pale yellowish silcrete, with the remainder in quartzite, quartz, indurated shale and chalcedony. The source of the silcrete raw material is unknown, although the palaeontologists report indicates that the superficial sediments on the site contain silcrete clasts. No outcrops of silcrete were found, although several large, heavily flaked chunks were located in the proposed Plant Area, suggesting a nearby source may occur.

The majority of the tools encountered during the study comprise modified (i.e. retouched & utilized), and unmodified, triangular shaped MSA flakes with prepared platforms, large, retouched and utilized blade tools, chunks, irregular cores, as well as several radial and flatter worked-out cores. Indications are, that most of the remains recorded represent discarded flakes and flake debris.

Few formal tools were found during the survey, restricted to one or two (possible) broken points and miscellaneous retouched pieces/possible scrapers, suggesting that formal retouched tools were removed from the site.

Significance of archaeological resources

The majority of the remains documented during the study have been graded as having low (Grade 3C) archaeological significance. This is due to the eroded and superficial context in which they were found.

However, potentially significant (Grade 3B) sites (i. e. tool production sites) associated with heuweltjies have been identified in the proposed Plant Area.

4.2. Palaeontology

According to Almond (2017), most of the proposed mining development area is covered by a thin veneer of Late Caenozoic superficial sediments that are underlain by ancient Precambrian rocks, some of which might contain fossil remains. The Late Precambrian carbonate bedrocks of the Widouw Formation (Gifberg Group, Gariep Supergroup) are metamorphosed, recrystallized and highly deformed, and therefore `very unlikely to contain any fossils'.

Almond notes that there have been previous reports of sizeable stromatolites (fossil microbial mounds) within the Widouw Formation near Vredendal, some 10kms or so to the east of the proposed new mine, but these records could not be confirmed. No fossil stromatolites were observed by Almond within the deformed marbles exposed in the study area, during the palaeontological field assessment. The carbonate bedrocks in the study site are largely mantled by a range of Late Caenozoic superficial deposits (wind-blown sands, sandy soils, gravels, silcrete and calcrete pedocretes &alluvium) that are up to 2m thick and `all of low palaeontological sensitivity'.

4.3 Comments from registered conservation bodies and the local municipality

Comments from registered conservation bodies (i. e. CapeNature), and the local Matzikama Municipality, and the West Coast District Municipality, are confined to bio-diversity and planning issues. No heritage related comments were received.

5. Conclusion

5.1 Archaeology

Indications are that proposed mining of the ± 34ha ore reserve on Farm Welverdiend No. 511, as well as construction and operation of a logistical facility, will impact negatively on archaeological heritage, resulting in the destruction and irreversible loss of archaeological resources.

However, the overall impact significance of proposed mining on Farm 511 is rated as being low.

Measures to ensure the protection and conservation of archaeological heritage within and outside the footprint of the Mine and Plant Area are, however, proposed.

Mitigation action proposals include the targeted collection of archaeological remains from the Plant Area, preparation of a Development Heritage Management Plan (DHMP) to manage the activities and phases of development that may impact heritage resources, possible establishment of buffer zones around sensitive archaeological areas, and monitoring of mining and site operations.

5.2 Palaeontology

According to Almond (2017:18), `the overall impact significance of the proposed mining development is inferred to be LOW' because most of the study area is mantled by superficial sediments of low palaeontological sensitivity. `No further specialist studies or mitigation regarding fossil heritage are therefore considered necessary for this project'.

6. Recommendations

6.1 Archaeology

With regard to proposed operation of a dolomitic limestone mine, and construction and operation of lime kilns on the Remainder of Farm 511 Welverdiend near Vanrhynsdorp, the following recommendations are made:

1. Mining of the 34ha ore reserve should be allowed to proceed, subject to the following conditions, which must be approved by Heritage Western Cape.

2. Buffer zones must be established around potentially significant archaeological remains in the proposed Plant Area, once the final layout of the logistical facility has been established.

3. A targeted collection of archaeological resources (i. e. Sites 3191, 3231, 3251, 3261, 3281, 3291, 3301, 3312, 3321, 3331, 3351, 3361, 3371, 3381, 3401 & 3421), must be undertaken in the Plant Area if buffer zones are not practical, or feasible.

4. Buffer zones must be established around potentially significant archaeological remains that occur outside the footprint area of the Mine (i. e. Sites 0512 & Sites 3018-3111), and the Plant Area (i.e. Sites 0592, 0632, 0652, 0682 & 0692).

5. A Development Heritage Management Plan (DHMP) must be implemented to manage the activities and phases of the development that may impact heritage resources within and outside, the application area. This will ensure no accidental or indirect impacts occur during all phases of the proposed development.

6. In order to ensure that heritage resources are not negatively impacted by mining operations and operation of the mine plant area, ongoing management and monitoring must be undertaken.

7. Should any unmarked human remains or ostrich eggshell caches be exposed or uncovered during prospecting, or trenching activities, these must immediately be reported to the contracted archaeologist (J Kaplan 082 321 0172), or Heritage Western Cape (Mr Andrew September 021 483 9543). Burials must not be disturbed until inspected by the archaeologist, or the Heritage Officer.

6.2 Palaeontology

1. Should substantial fossil remains (*e.g.* vertebrate teeth, bones, petrified wood, stromatolites, shells, trace fossils) be exposed during mining, the ECO should safeguard these, preferably *in situ*, and alert Heritage Western Cape (Mr Andrew September

021 483 9543) as soon as possible so that appropriate action (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist at the developer's expense

The above palaeontological and archaeological recommendations must be included in the Environmental Management Plan (EMP) for the proposed development.

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1. INTRODUCTION

ACRM was appointed by Afrimat Aggregates (Pty) Ltd to conduct a Heritage Impact Assessment (HIA) for a proposed dolomitic limestone mine, and construction of lime kilns on the the Remainder of the Farm Welverdiend No. 511, located approximately 8kms south west of Vanrhynsdorp, in the Knersvlakte region of the Western Cape (Figures 1 & 2).

A HIA, comprising an archaeological and palaeontological study was requested by Heritage Western Cape (*HWC Case No. 6103109AS1128E*), following the submission of a Notice of Intent to Develop (NID).

HWC also requested that comments from registered conservation bodies and the local municipality must also be included in the final HIA report, which forms part of an Environmental Impact Assessment (EIA) process.

ACRM was subsequently commissioned to undertake the specialist archaeological study and write up the integrated HIA report.

Dr John Almond was commissioned to undertake the specialist palaeontological study (or PIA).

Figure 1. Locality map indicating the location site for the proposed prospecting on Farm 511, near Vanryhnsdorp

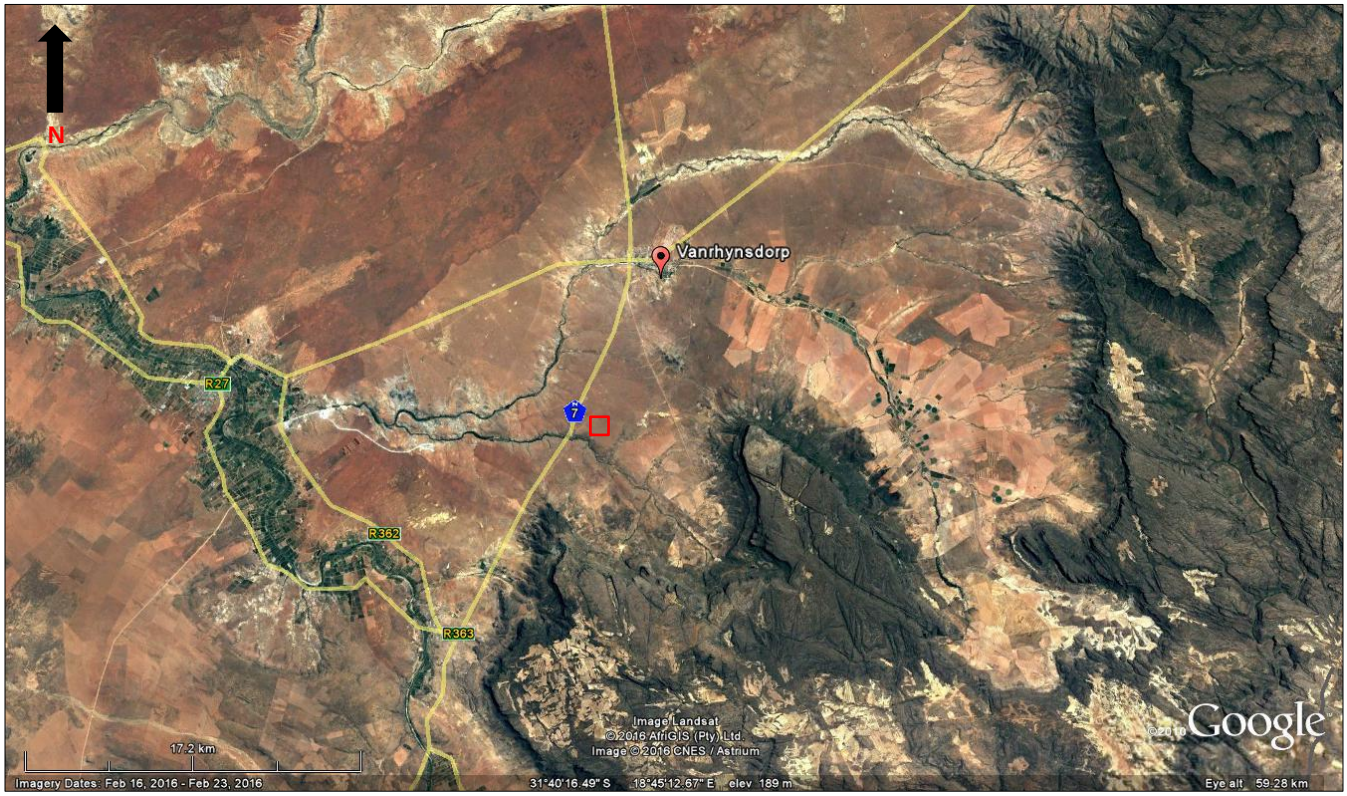

Figure 2. Google satellite photograph indicating the study site (red polygon) in relation to Vanrhynsdorp.

2. THE DEVELOPMENT PROPOSAL

The development comprises the clearing of ± 40ha of virgin land for the purpose of mining limestone deposits, and the construction of a crushing plant, lime kilns and associated logistical facilities such as workshops and an office complex.

The total footprint of the mining development will be about 34ha, and the process plant and logistical facilities will have a maximum footprint of ± 10ha. The layout of the Plant Area will be planned to allow the phasing in of the four kilns to the process line, as and when required.

Access roads to the facility will be extended from the existing tarred access road from the N7.

Mining will be done by removal of overburden to expose the underlying limestone. Overburden thickness varies from virtually none on the southern end of the deposit to ± 10m on the northern side. This allows strip mining to be done by drilling and blasting ± 30m wide and 50m long strips on the shallow end of the deposit. Excavation of blasted limestone will be done by an excavator, and trucks will haul the limestone to the crushing plant. The mining and crushing plant will operate on a single day shift basis. Lime produced will be stored in silos before being dispatched to various clients in bulk tanker or bulk bags. The operation of the kilns will be, by nature of the process, a continuous operation.

3. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA No. 25 of 1999) protects archaeological and palaeontological sites and materials, as well as graves/cemeteries, battlefield sites and buildings, structures and features over 60 years old. The South African Heritage Resources Agency (SAHRA) administers this legislation nationally, with Heritage Resources Agencies acting at provincial level. According to the Act (Sect. 35), it is an offence to destroy, damage, excavate, alter of remove from its original place, or collect, any archaeological, palaeontological and historical material or object, without a permit issued by the SAHRA or applicable Provincial Heritage Resources Agency, *viz*. Heritage Western Cape (HWC).

Notification of HWC is required for proposed developments exceeding certain dimensions (Sect. 38), upon which they will decide whether or not the development must be assessed for heritage impacts (an HIA) that may include an assessment of archaeological (a AIA) or palaeontological heritage (a PIA).

4. TERMS OF REFERENCE

The terms of reference for the study were to:

1. Determine whether there are likely to be any important archaeological and palaeontological resources that may be impacted by the proposed development;

2. Indicate any constraints that would need to be taken into account in considering the development proposal;

3. Identify possible `No-Go` areas, and

4. Recommend mitigation action

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The study site is located approximately 1 km east of the N7 between the towns of Klawer and Vanrhynsdorp, just north of the Wiedouw River, and about 8 km south west of Vanrhynsdorp itself (Figure 3). An abandoned marble mine (Jumaqua Marble) is located about 3kms to the north east.

5.1 Mine Area

The sloping site overlooks the Wiedouw River, and is bisected on either side by two non-perennial streams. A tarred access from the N7 road bounds the site in the north, and alongside its eastern boundary. The proposed development site is covered in dry grassland vegetation, with a few sporadic trees occurring in places (Figures 4-6). Erosion is visible on the west and east facing slopes where some of the top soils have washed away, and on the flatter northern portion, where several old roads, fence lines and animal tracks cut across the area. There is a large test pit on the southern boundary of the proposed mining area, where the densely vegetated site slopes steeply down to the river. No mining will take place on these botanically sensitive slopes, which is a

declared Critical Biodiversity Area (CBA). Apart from the two dry streams, there are no significant landscape features on the proposed development site.

5.2 Plant Area

The proposed Plant Area is located about 250m east of the proposed Mine Area. The largely level site is covered in dry grassland vegetation, with sporadic Acacia trees occurring in places (Figures 7-9). Heuweltjies dotted around the site appear as low mounds with eroded circular areas surrounding them. Areas surrounding the heuweltjies are quite eroded and denuded of vegetation. Several old gravel farm roads cut across the proposed development site in the north. A few heavily scraped areas and some diggings are also present. Piles of rocks occur in places. There are no significant landscape features on the proposed site.

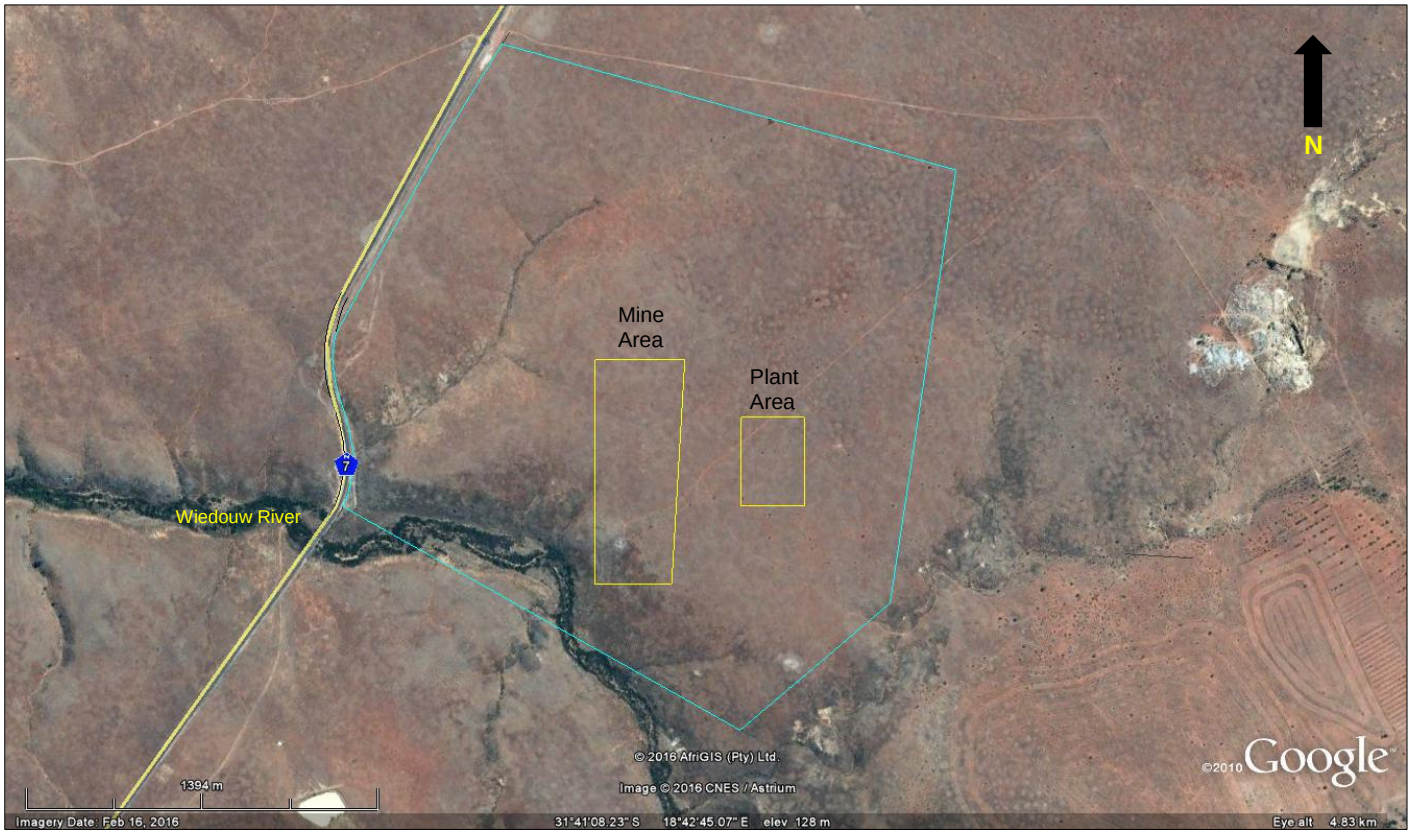

Figure 3. Google satellite map of the illustrating the proposed Mining Area and Plant Area.

Figure 4. Proposed Mine Area. View facing north west. The ore reserve extends beyond the hill in the distance

Figure 5. Proposed Mine Area. View facing south east with the Gifberg in the distance

Figure 6. Proposed Mine Area. View facing south with the Gifberg in the distance

Figure 7. Proposed Plant Area. View facing north. Note the tarred access road to the left of the plate

Figure 8. Proposed Plant Area. View facing east with the Gifberg in the distance

Figure 9. Proposed Plant Area. View facing south with the Gifberg in the distance

6. STUDY APPROACH

6.1 Method

The purpose of the HIA is to assess the sensitivity of archaeological and palaeontological resources in the study area, to determine the potential impacts on such resources, and to avoid and/or minimize such impacts by means of management and/or mitigation measures.

6.2 Archaeology

The significance of archaeological resources was assessed in terms of their content and context. Attributes considered in determining significance include artefact and/or ecofact types, rarity of finds, exceptional items, organic preservation, potential for future research, density of finds and the context in which archaeological traces occur.

The field assessment was undertaken by ACRM on 30 March, 2017. The position of identified archaeological resources, were plotted using a hand held GPS unit set on the map datum wgs 84. A track path of the survey was also captured. The archaeologist was assisted by ASAPA/CRM registered archaeologist, Guy Slingsby.

A literature survey was carried out to assess the heritage context surrounding the proposed development site.

Heritage Western Cape (2012) uses a system in which archaeological resources of local significance are divided into Grade 3A, 3B and 3C. These equate to *high*, *medium* and *low* local significance. This grading system is employed in the present report.

6.3 Palaeontology

The specialist palaeontological report informs about the palaeontological sensitivity of the project area, and the probability of palaeontological materials (i. e. fossils) being being disturbed or destroyed in the process of excavations associated with the proposed development.

The main purposes of the PIA report are to:

- Identify, describe and assess palaeontological/fossil heritage resources in the proposed Mine and Plant Area, and

- Suggest mitigatory actions to be taken with respect to the occurrence of fossils during the course of the development.

The 2017 field-based palaeontological report updates and amplifies a previous desktop report for limestone mining on Farm 511 Welverdiend by Almond (2011).

The PIA report is based on:

1. A review of the relevant scientific literature, as well as satellite images;

2. Published geological maps;

3. Background information and maps supplied for the project, and

4. The author's own database and field experience of the rock units concerned.

6.4 Constraints and limitations

There were no constraints or limitations associated with the study.

Archaeological visibility was very good and access to the site was made possible by Mr Gerhard Terreblanche of Cape Lime (Pty) Ltd/Afrimat Aggregates.

6.5 Identification of potential risks

Archaeological heritage will be impacted by proposed mining activities, as well as the construction of site infrastructure, which will result in the irreversible loss of potentially significant archaeological resources.

The results from the PIA study indicate there are no palaeontological risks associated with the proposed development.

7. ARCHAEOLOGICAL CONTEXT

The landscape around Vanrhynsdorp is dominated by the semi-arid flatlands of the Knersvlakte. Studies have shown that archaeological visibility is very high in this dry region of the south Western Cape Province, where many implements of mixed age are found on eroded surfaces (Orton et al 2011a).

Orton (2012a) has undertaken extensive fieldwork in this region and has mapped scatters of both Middle Stone Age (MSA) and Later Stone Age (LSA) material alongside the Sout and Varsche Rivers. Much of Orton's work has focussed on identifying the indigenous Later Stone Age hunter-gatherer groups living in the landscape over the last 5000 years (Orton et al 2011). His work has shown that MSA and LSA archaeological remains are strongly concentrated around the floodplains of the many drainage channels that occur in the surrounding landscape, and are usually revealed in eroding and deflated areas. Early Stone Age (ESA) occurrences on the other hand tend to be found among the (older) river gravel terraces further away (Orton pers. comm. 2013).

Mackay et al (2010) documented an open air bifacial point manufacturing site, possibly dating to the Still Bay period of the MSA more than 70 0000 years ago alongside the Varsche River. Pottery at the site indicates some LSA occupation as well, while another open site nearby shows extensive LSA occupation during the mid - and late Holocene (Orton 2012). Orton et al (2011) have excavated rock shelters with LSA deposits spanning the last 6000 years, while one of the sites revealed the oldest dated cattle bone from South Africa at about AD 200 to AD 300 (Orton et al 2012).

Orton (2012, 2011a, b) has also documented dispersed scatters of LSA and MSA implements mostly associated with dry pans and heuweltjies during the course of several commercial archaeological surveys. Large numbers of LSA implements have been recorded by Kaplan (2010) on the farm Zoutfontein north of the Sout River during

scoping for a wind energy farm, while large numbers of MSA and limited numbers of ESA and LSA tools were recorded south of the Droerivier during a HIA for a solar energy farm (Kaplan 2012). Small numbers of quartz, silcrete and quartzite tools were recorded during a study east of the St Gobain gypsum mine in Vanrhynsdorp (Smith 2011). Large numbers of MSA tools, including a well preserved LSA occupation site were recorded on the farm Raskraal (an extension of the St. Gobain mine), about 10kms north east of Vanrhynsdorp (Kaplan 2013). According to Orton (pers. comm. 2013), well preserved LSA sites are quite rare in the region.

It should be noted that a smaller study on Farm 511 has already been done by Kaplan (2010b), who recorded large numbers of LSA tools and limited numbers of MSA lithics on an 8ha portion of the property. These included sharpened flakes, chunks, cores, MSA blade tools and several retouched tools such as LSA scrapers and adzes. No cultural remains such as pottery, or ostrich eggshell were found during the baseline study.

8. FINDINGS

8.1 Archaeology

A spreadsheet of waypoints and description of the archaeological finds is presented in Table 1.

Large numbers of stone implements were recorded in both the footprint area of the proposed Mine Area, as well as in the footprint area of the proposed Plant Area, while a large numbers of tools were also documented outside the study area (Figure 10). The remains, however, are spread quite thinly and unevenly over the surrounding landscape.

In the proposed Mine Area, most of the tools particularly on the west, and north east facing slopes occur on compact red Pleistocene sands, where the top soils have been washed or eroded away, indicating that more tools very likely occur below the superficial surface deposits. On the flatter northern portion of the Mine Area, tools were also encountered on eroded patches of ground where some of the top soils have eroded and washed away, and in disturbed areas such as in old farm roads, along fence lines and in animal tracks. There are also large areas on the lower slopes of the proposed Mine Area where very few or no tools were found. The Critical Biodiversity Area (CBA) above the Wiedouw River was not searched as no development will take place across this densely vegetated area.

Orton et al 2011b has suggested that much of the Knersvlakte region around Vanrhynsdorp is covered by a thin layer of stone artefacts whose distribution is partly the result of erosive forces. The occurrences documented simply being surfaces revealed by erosion rather than actual occupation sites. This appears to be the pattern replicated in the Mine Area as well.

While relatively large numbers of tools in the Plant Area occur in a similarly eroded and disturbed context, *in-situ* archaeological resources are associated with heuweltjies that are scattered around the footprint area. Heuweltjies in the more level Plant Area appear as low mounds with eroded circular or semi-circular areas surrounding them. Areas surrounding these heuweltjies are eroded and denuded of vegetation. Tools, including round and flat worked out cores, large heavily flaked silcrete chunks; unmodified flakes, anvils and hammerstones indicate possible activity/stone knapping areas. Sites listed

below, where discarded tools and flake debris associated with heuweltjies occur, are rated as having *medium* (Grade 3B) significance.

No heuweltjies were located in the proposed Mine Area, although scatters of tools and flake debris associated with heuweltjies on old land surfaces occur outside the footprint of the Mine Area (e.g. Sites 3041, 0512 & 3081-3111).

Scatters of tools associated with heuweltjies also occur to the north of the Plant Area, (i. e. Sites 0632, 0652 & 0692).

It is estimated that more than 95% of the stone tools recorded are assigned to the Middle Stone Age (MSA), while the frequency of Early Stone Age (ESA) and Later Stone Age (LSA) tools is very low. Several ESA bifaces and hand axes were found (sites 2621, 2681, 2701 & 0772), while no organic remains such as ostrich eggshell or pottery were encountered.

More than 90% of the tools recorded in both the proposed Mine and Plant Area are in fine grained pale yellow silcrete, with the remainder in quartzite, quartz, indurated shale and chalcedony (Site 0422). Most of the archaeological traces encountered comprised modified (i.e. retouched & utilized), and unmodified, triangular shaped flakes with prepared platforms, large, heavily retouched and utilized blade tools, chunks, irregular cores, as well as several radial, and flat worked-out cores.

The source of the silcrete raw material is unknown although Almond (2017) mentions that the superficial sediments on the site contain silcrete clasts. While no outcrops or exposures of silcrete were found, several large irregular cores, large flat worked out cores, and large, multiple flaked chunks were recorded in the proposed Plant Area (associated with heuweltjies), suggesting a nearby source of silcrete might occur.

Few formal tools were found during the baseline study, restricted to one or two possible broken unifacial points (Site 3251 & 0402) and miscellaneous pieces/possible scrapers (Site 2571), suggesting that formal retouched tools were likely removed from the area, to occupation sites elsewhere.

Indications therefore, are that the majority of the archaeological resources documented during the study represent discarded flakes and flake debris (i. e. cores, unmodified flakes & chunks), but that potentially significant activity areas are concentrated around eroded heuweltjies in the proposed Plant Area.

A collection of tools documented during the study is presented in Figures 11-35.

8.1 Significance of archaeological resources

The majority of the remains recorded during the study have been graded as having low (Grade 3C) archaeological significance.

However, potentially significant (Grade 3B) sites (i. e. *in situ* activity areas) associated with heuweltjies have been identified in the proposed Plant Area.

These include the following:

Site 3191	Site 3301	Site 3381
Site 3231	Site 3312	Site 3391
Site 3251	Site 3331	Site 3401
Site 3261	Site 3351	Site 3421
Site 3281	Site 3361	Site 3321
Site 3291	Site 3371	

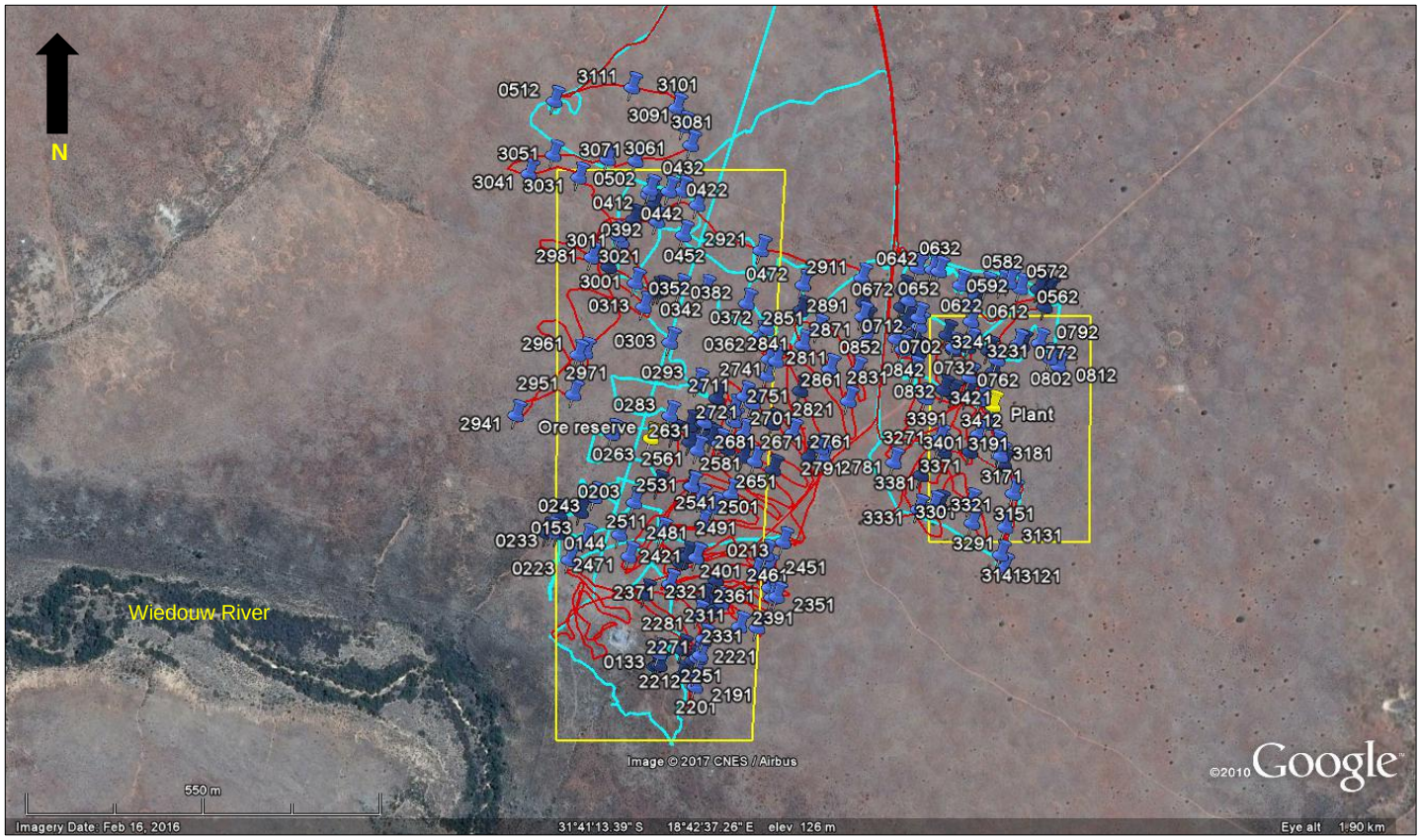

Figure 10. Waypoints of archaeological finds and track paths (in read and blue)

Site	Name of Farm	Lat/long	Description of finds
	Farm 511 Welverdiend		
Mining Area			
2201		S31° 41.445' E18° 42.605'	Quartzite MSA flake
2212		S31° 41.434' E18° 42.606'	Fairly extensive scatter of MSA silcrete flakes, chunks, large heavily retouched MSA blades on eroded patch of compact orange/red sands below the topsoil, on west facing slopes
2221		S31° 41.421' E18° 42.607'	Dispersed scatter of silcrete MSA flakes, large chunks, flaked chunks, large retouched/utilized blades, round cores, on smaller patch of ground below the eroded top soils – west facing slopes
2231		S31° 41.423' E18° 42.603'	Silcrete MSA flakes, chunks and core on smaller patch of washed/eroded sand above stream

2251		S31° 41.419' E18° 42.610'	Small scatter of MSA and possibly some LSA tools on soft orange brown sands, below the top soils. Large silcrete flakes, round core, above stream
2261		S31° 41.414' E18° 42.593'	Large silcrete core & broken prepared core
2271		S31° 41.405' E18° 42.614'	Large silcrete flake, round chunky silcrete flake
2281		S31° 41.385' E18° 42.608'	Large silcrete flake/blade, several silcrete retouched flakes and chunks, on patch of red sand below the top soils
2291		S31° 41.382' E18° 42.621'	Large silcrete chunky retouched cortex flake, round quartz core
2301		S31° 41.372' E18° 42.616'	Broken silcrete core and several large silcrete flakes on patch of red sand
2311		S31° 41.395' E18° 42.649'	Silcrete flakes on patch of red sand
2321		S31° 41.375' E18° 42.631'	Small blade on trampled red sands
2331		S31° 41.396' E18° 42.666'	Quartzite chunk
2341		S31° 41.380' E18° 42.625'	2 large silcrete MSA retouched flakes on patch of compact red sand
2351		S31° 41.370' E18° 42.686'	Smaller silcrete broken MSA flake
2361		S31° 41.362' E18° 42.678'	MSA silcrete flake on trampled red sands
2371		S31° 41.359' E18° 42.580'	Broken MSA silcrete flake
2381		S31° 41.356' E18° 42.626'	MSA silcrete flake on red sands
2391		S31° 41.371' E18° 42.681'	Chunky MAS silcrete flake
2401		S31° 41.350' E18° 42.665'	Several large MSA silcrete flakes, smaller flake & chunks on patch of red sand
2412		S31° 41.342' E18° 42.591'	Broken silcrete chunk
2421		S31° 41.337' E18° 42.606'	Side struck MSA silcrete flake
2431		S31° 41.336' E18° 42.597'	Retouched MSA silcrete flake
2441		S31° 41.337' E18° 42.607'	Silcrete chunk
2451		S31° 41.347' E18° 42.677'	Smaller ?LSA silcrete flake on red sands
2461		S31° 41.335' E18° 42.675'	MSA silcrete flake
2471		S31° 41.336' E18° 42.540'	LSA silcrete flake
2481		S31° 41.309' E18° 42.612'	Silcrete flake
2491		S31° 41.295' E18° 42.625'	Silcrete chunk
2501		S31° 41.288' E18° 42.611'	Several larger MSA silcrete flakes on patch of compact red sands
2511		S31° 41.316' E18° 42.572'	Large MSA silcrete utilized/retouched flake/blade
2521		S31° 41.277' E18° 42.601'	Quartzite irregular core
2531		S31° 41.277' E18° 42.602'	Quartzite chunk/core
2541		S31° 41.284' E18° 42.641'	Silcrete core
2551		S31° 41.240' E18° 42.600'	Dispersed scatter of MSA silcrete flakes, Inc. large blade and smaller flakes, large chunk, large weathered quartzite chunk, on washed sands below the top soils
2561		S31° 41.247' E18° 42.608'	Round silcrete core and flake
2571		S31° 41.246' E18° 42.637'	LSA scraper/MRP
2581		S31° 41.242' E18° 42.629'	Large, embedded quartzite chunk, large quartz core
2591		S31° 41.238' E18° 42.622'	Large silcrete flake
2601		S31° 41.235' E18° 42.616'	Large MSA silcrete flake, large round core, chunks – alongside acacia tree
2611		S31° 41.226' E18° 42.600'	2 large MSA silcrete flakes on patch of sand alongside 2 track road
2621		S31° 41.225' E18° 42.613'	Large core, large chunk and ESA biface, in twee spoor track – surrounding area very disturbed, fence/road

2631		S31° 41.224' E18° 42.615'	Collection from 2010 study
2641		S31° 41.253' E18° 42.653'	Large silcrete MSA blade
2651		S31° 41.256' E18° 42.664'	Retouched MSA silcrete flake
2661		S31° 41.264' E18° 42.682'	MSA silcrete flake
2671		S31° 41.234' E18° 42.653'	Round silcrete flake, utilized silcrete blade
2681		S31° 41.223' E18° 42.643'	Dispersed scatter of MSA tools including cortex flake/blade and several? LSA flakes, lovely indurated shale cobble core – on compacts red sands. Also ESA biface & large flake
2691		S31° 41.204' E18° 42.627'	Sporadic scatter of large MSA silcrete flakes on red sands alongside fence/small track
2701		S31° 41.214' E18° 42.643'	ESA biface, MSA flakes & blade in animal track
2711		S31° 41.202' E18° 42.654'	MSA quartzite flake
2721		S31° 41.208' E18° 42.662'	Chunk and MSA silcrete flake
2731		S31° 41.225' E18° 42.682'	MSA silcrete flakes, chunks, core/chunk – on flat terrace patch
2741		S31° 41.173' E18° 42.685'	Dispersed flake/blade, chunks, flakes – in silcrete
2751		S31° 41.185' E18° 42.676'	Silcrete chunk
2761		S31° 41.233' E18° 42.701'	MSA silcrete flake and chunk
2771		S31° 41.253' E18° 42.718'	Several MSA flakes and chunks in silcrete and indurated shale alongside small track.
2781		S31° 41.255' E18° 42.732'	Small quartzite chunk
2791		S31° 41.246' E18° 42.729'	Dispersed scatter of a few MSA silcrete flakes
2801		S31° 41.198' E18° 42.709'	Large silcrete core/chunk, quartzite flake and chunks, round silcrete core
2811		S31° 41.171' E18° 42.678'	MSA silcrete flake & round core near fence, flat worked out core, large flake, chunks on compact red sands – also quartzite MSA flakes
2821		S31° 41.206' E18° 42.756'	Embedded chunk, a few sporadic flakes and chunk in animal track
2831		S31° 41.179' E18° 42.738'	Chunky broken silcrete flake, several flakes in track
2841		S31° 41.159' E18° 42.711'	Large MSA silcrete blade, small dispersed scatter of MSA silcrete and quartzite flakes & chunks
2851		S31° 41.146' E18° 42.727'	Quartzite core, dispersed scatter of MSA silcrete flakes, chunks on trampled ground/gravels
2861		S31° 41.181' E18° 42.764'	Sporadic scatter, including silcrete cores, silcrete flakes, chunks, pointed flake – close to road
2871		S31° 41.156' E18° 42.774'	Sporadic scatter of MSA silcrete flakes and chunks alongside road (see above)
2881		S31° 41.139' E18° 42.774'	Same as above
2891		S31° 41.136' E18° 42.770'	Hammerstone, chunk/core
2901		S31° 41.124' E18° 42.771'	MSA silcrete flake
2911		S31° 41.103' E18° 42.770'	Chunk and silcrete flake
2921		S31° 41.080' E18° 42.670'	MSA silcrete blade & chunk
2931		S31° 41.054' E18° 42.545'	MSA silcrete flake
2941		S31° 41.218' E18° 42.429'	MSA silcrete flake
2951		S31° 41.201' E18° 42.486'	Silcrete core on cut red earth bank
2961		S31° 41.167' E18° 42.490'	Quartzite chunk
2971		S31° 41.165' E18° 42.497'	MSA chunky silcrete flake
2981		S31° 41.086' E18° 42.504'	MSA silcrete flake & chunk/core – burrow
2991		S31° 41.094' E18° 42.521'	MSA Silcrete blade/flake
3001		S31° 41.107' E18° 42.547'	MSA snapped silcrete blade
3011		S31° 41.073' E18° 42.533'	Round MSA silcrete flake
3021		S31° 41.068' E18° 42.530'	Broken quartzite flake

3031		S31° 41.019' E18° 42.491'	MSA quartzite flake & chunk
3041		S31° 41.016' E18° 42.442'	Dispersed scatter of MSA flakes in silcrete and quartzite & chunks alongside heuweltjie /road – outside footprint area
3051		S31° 41.000' E18° 42.466'	2 silcrete MSA flakes
3061		S31° 41.004' E18° 42.519'	Large round quartz core, quartzite chunk/core, large MSA silcrete flake on gravels alongside track
3071		S31° 41.005' E18° 42.547'	MSA silcrete flake & chunk
3081		S31° 40.992' E18° 42.601'	Dispersed scatter of MSA silcrete and quartzite flakes, quartzite chunk, large ESA chunk on patch of compact sand – outside footprint area
3091		S31° 40.976' E18° 42.594'	Thin scatter of MSA silcrete flakes, chunks and MSA quartzite – extension of above
3101		S31° 40.961' E18° 42.587'	Dispersed scatter of tools on compact orange/red sands, including large MSA silcrete flakes, chunks, several flat worked out silcrete cores, MSA quartzite flakes, chunks, core, hammerstone – **outside** footprint area
3111		S31° 40.944' E18° 42.543'	Wide, but dispersed scatter of smaller ?LSA silcrete flakes, chunks, quartzite MSA flake – **outside** footprint area
Plant Area			
3121		S31° 41.346' E18° 42.909'	Thin scatter of large MSA silcrete flakes and chunks under canopy of large acacia tree
3131		S31° 41.312' E18° 42.911'	Large silcrete core/chunk several MSA silcrete flakes, flat worked out core, chunks & MSA quartzite flake on softer patch of red sands
3141		S31° 41.335' E18° 42.906'	Very large silcrete chunk/flake
3151		S31° 41.284' E18° 42.918'	MSA silcrete chunk
3161		S31° 41.259' E18° 42.909'	Denticulate MSA silcrete flake, large broken hammerstone, broken **biface**,
3171		S31° 41.252' E18° 42.906'	Large round core
3181		S31° 41.243' E18° 42.901'	Wide, but dispersed scatter of MSA silcrete flakes, chunks, core, quartz chunks
3191		S31° 41.225' E18° 42.893'	Large, fairly extensive, but sporadic scatter of MSA tools on compact red sands, including 3-4 large cores, one large embedded core, an anvil, and large silcrete MSA flakes, surrounding a small **huewelt jie**
3201		S31° 41.249' E18° 42.876'	Silcrete chunk
3211		S31° 41.202' E18° 42.873'	Silcrete chunk
3231		S31° 41.157' E18° 42.876'	Dispersed scatter of tools, including silcrete cores and MSA silcrete flakes, MSA quartzite flakes – associated with **heuweltjie**
3241		S31° 41.140' E18° 42.877'	MSA silcrete flake and chunk
3251		S31° 41.127' E18° 42.950'	Several large MSA silcrete flakes, quartzite flakes, quartz pieces, small quartzite **bifacial** flake/point, smaller, flat silcrete flake associated with **heuweltjie**, 20m **outside** the northern boundary of the footprint area
3261		S31° 41.182' E18° 42.899'	Large quartz core, large silcrete MSA flakes, quartz chunks/cores– associated with **heuweltjie**
3271		S31° 41.238' E18° 42.846'	Large round silcrete core, next to **heuweltjie**
3281		S31° 40.670' E18° 41.861'	Dispersed scatter of quartz and MSA silcrete flakes, round quartz core – associated with **heuweltjie**

3291		S31° 41.308' E18° 42.878'	Small, dispersed including large anvil, large worked-out silcrete core, MSA silcrete flakes
3301		S31° 41.292' E18° 42.876'	Several MSA silcrete and quartzite flakes, silcrete and quartz cores – associated with **heuweltjie**
3312		S31° 41.293' E18° 42.846'	Large worked-out silcrete core, quartz chunk, quartz core – associated with **heuweltjie**
3321		S31° 41.294' E18° 42.840'	Large and smaller irregular cores, large silcrete flakes, quartz flakes – associated with **heuweltjie**
3331		S31° 41.297' E18° 42.825'	Dispersed scatter of tools - **heuweltjie**
3351		S31° 41.268' E18° 42.828'	Quartz and silcrete flakes, large side struck flake, MSA quartz flake, large MSA flake blade, silcrete cores, small quartzite hammerstone – associated with **heuweltjie** alongside small animal track
3361		S31° 41.248' E18° 42.850'	Silcrete core, quartz and silcrete chunks and MSA flakes, small worked-out core, large round core – associated with **heuweltjie**
3371		S31° 41.244' E18° 42.846'	Core-reduced silcrete blade/flake, several round silcrete cores, large MSA silcrete core – associated with **heuweltjie**
3381		S31° 41.258' E18° 42.801'	Dispersed scatter of MSA tools in a wide arc, including broken quartzite anvil, silcrete flakes and cores, lots of quartz about - associated with **heuweltjie** about 30m from tar access road – outside footprint area
3391		S31° 41.204' E18° 42.832'	Worked out silcrete core, MSA silcrete flakes associated with **heuweltjie** 10m outside footprint area near the western boundary of the proposed site
3401		S31° 41.234' E18° 42.884'	MSA silcrete flakes, quartz core, chunk and flake associated with **heuweltjie**
3412		S31° 41.205' E18° 42.886'	Dispersed scatter of large MSA silcrete blades, core, quartzite MSA flakes, quartzite core and flakes alongside gravel road
3421		S31° 41.186' E18° 42.876'	Sporadic scatter of tools including MSA silcrete and quartzite flakes and chunks, cores, quartz chunks, core, associated with **heuweltjie** close to gravel road that cuts across the footprint area
3431		S31° 41.164' E18° 42.860'	Scatter of MSA silcrete flakes, silcrete core, quartzite flake, quartzite cortex/cobble core on road gravels
3441		S31° 41.197' E18° 42.850'	Dispersed scatter of tools – large and small silcrete MSA flakes, MSA quartzite flakes, round quartz core
Mining Area			
0083		S31° 41.436' E18° 42.591'	Quartz core
0103		S31° 41.427' E18° 42.570'	MSA silcrete core, large utilized/retouched flake
0113		S31° 41.427' E18° 42.568'	X 2 large silcrete MSA flakes, silcrete chunk, quartzite flake below topsoil's
0123		S31° 41.428' E18° 42.566'	Broken silcrete flake
0133		S31° 41.417' E18° 42.570'	Silcrete MSA flake, chunks
0144		S31° 41.318' E18° 42.531'	MSA silcrete flake
0153		S31° 41.321' E18° 42.498'	Scatter of silcrete tools, including utilized/retouched flakes, core, chunks,
0163		S31° 41.317' E18° 42.470'	Silcrete MSA blade
0173		S31° 41.317' E18° 42.459'	Broken utilized silcrete flake

0184		S31° 41.302' E18° 42.472'	Worked out silcrete core, utilized/retouched silcrete flakes, unmodified silcrete flakes, close to stream bed
0193		S31° 41.299' E18° 42.493'	Silcrete utilized flake
0203		S31° 41.291' E18° 42.545'	ESA handaxe, retouched silcrete MSA flake, MSA quartzite flake
0213		S31° 41.324' E18° 42.692'	Utilized silcrete MSA flake
0223		S31° 41.339' E18° 42.481'	MSA silcrete flake with some step flaking
0233		S31° 41.316' E18° 42.464'	Utilized MSA silcrete flake
0243		S31° 41.287' E18° 42.506'	Utilized silcrete MSA flake, unmodified silcrete flake
0253		S31° 41.277' E18° 42.569'	Retouched indurated shale flake
0263		S31° 41.277' E18° 42.569'	3 MSA flakes, 1 chunk, 2 round cores – all silcrete
0273		S31° 41.234' E18° 42.584'	6 MSA flakes,1 chunk – all silcrete
0283		S31° 41.218' E18° 42.580'	4 MSA flakes,2 chunks in cutting
0293		S31° 41.191' E18° 42.608'	Quartz core, 2 silcrete utilized/retouched flakes, 1 chunk
0303		S31° 41.157' E18° 42.581'	4 MSA flakes, 1 chunk, 1 core – all silcrete
0313		S31° 41.127' E18° 42.555'	3 MSA silcrete flakes on red sands
0322		S31° 41.115' E18° 42.567'	4 MAS silcrete flakes, 1 core in small track
0332		S31° 41.114' E18° 42.572'	5 MSA flakes, 2 chunks – in silcrete in track. Quartz chunk/core
0342		S31° 41.113' E18° 42.590'	Silcrete core and MSA flake
0352		S31° 41.113' E18° 42.615'	Round quartzite core, chunk & MSA flake in silcrete
0362		S31° 41.152' E18° 42.669'	Utilized/retouched silcrete MSA flake
0372		S31° 41.145' E18° 42.676'	2 silcrete MSA flakes, old glass bottle
0382		S31° 41.125' E18° 42.656'	5 MSA silcrete flakes, 2 chunks, 1 core
0392		S31° 41.056' E18° 42.568'	2 silcrete core, including 1 prepared core, ± 10 MSA silcrete flakes, 3 chunks,
0402		S31° 41.041' E18° 42.565'	4 MSA flakes, possible bifacial MSA point, chunk – all in silcrete
0412		S31° 41.033' E18° 42.560'	3 MSA flakes, 1 pointed flake, 1 core & 2 chunks – all in silcrete
0422		S31° 41.031' E18° 42.580'	LSA chalcedony flake in track
0432		S31° 41.030' E18° 42.593'	3 large MSA silcrete flakes, 1 smaller LSA red silcrete flake
0442		S31° 41.042' E18° 42.608'	Round core, chunk & MSA flake – all in silcrete
0452		S31° 41.067' E18° 42.594'	1 round core, 1 prepared core, 2 MSA flakes, 1 chunk – all in silcrete
0472		S31° 41.109' E18° 42.712'	5 small ?LSA silcrete flakes
0482		S31° 41.130' E18° 42.709'	Higher density scatter of tools including ± 20 MSA flakes, 3 cores, 5 chunks all in silcrete, 2 indurated shale cortex (weathered) MSA flakes
0502		S31° 41.029' E18° 42.561'	5 MSA flakes, 2 cores, 2 chunks – all in silcrete
0512		S31° 40.955' E18° 42.467'	±30 MSA silcrete flakes, 10 chunks, 1 round core, one blade core, 1 quartz core, chunks, indurated shale core, retouched MSA quartzite flake, on exposed red sands below topsoil - **outside** the footprint area
Plant Area			
0522		S31° 41.114' E18° 42.954'	2 silcrete MSA flakes
0532		S31° 41.114' E18° 42.951'	3 silcrete MSA flakes
0542		S31° 41.111' E18° 42.945'	Retouched quartzite flake in old road
0552		S31° 41.113' E18° 42.943'	2 MSA silcrete flakes in road
0562		S31° 41.112' E18° 42.925'	4 MSA silcrete flakes & 2 chunks

0572		S31° 41.107' E18° 42.915'	9 MSA silcrete flakes
0582		S31° 41.109' E18° 42.907'	Silcrete core
0592		S31° 41.111' E18° 42.892'	10 MSA silcrete flakes, 10 chunks, 1 quartz retouched flake, 1 quartz core, quartz chunks, some porcelain & glass – **outside** the study area
0602		S31° 41.115' E18° 42.881'	5 MSA silcrete flakes
0612		S31° 41.124' E18° 42.876'	2 MSA silcrete flakes in road
0622		S31° 41.109' E18° 42.866'	Several MSA silcrete flakes, quartz flakes and chunks, porcelain – alongside a small heuweltjie
0632		S31° 41.098' E18° 42.845'	± 30 MSA silcrete flake in a radius of about 10m, including a few cores, quartz core and flakes and retouched silcrete blade – **outside** footprint area
0642		S31° 41.096' E18° 42.839'	Large silcrete core
0652		S31° 41.095' E18° 42.824'	Large quartzite core, MSA silcrete flakes, quartz chunk and core, notched silcrete flake, broken indurated shale flake, chunk, on a small hummock/**heuweltjie** – **outside** footprint area
0662		S31° 41.114' E18° 42.810'	2 MSA silcrete flakes
0672		S31° 41.122' E18° 42.816'	4 MSA silcrete flakes, 1 quartz MRP, 3 quartz flakes
0682		S31° 41.127' E18° 42.809'	2 silcrete MSA flakes, 1 silcrete radial core. Large numbers of flakes between 067 & 062 – **outside** footprint area
0692		S31° 41.139' E18° 42.813'	8 MSA silcrete flakes, blade and core – **heuweltjie outside** footprint area
0702		S31° 41.144' E18° 42.826'	3 MSA silcrete flakes
0722		S31° 41.151' E18° 42.853'	Large, round silcrete core, quartzite core, several quartz flakes, smaller round silcrete core
0732		S31° 41.161' E18° 42.859'	5 MSA silcrete flakes, 1 round silcrete core, quartzite MSA flake
0742		S31° 41.161' E18° 42.874'	2 round silcrete cores, several silcrete MSA flakes and chunks, alongside road. Large numbers of MSA silcrete and some quartzite flakes in surface scraped area
0752		S31° 41.164' E18° 42.894'	MSA quartzite flake
0762		S31° 41.172' E18° 42.903'	Dispersed scatter of smaller (?LSA) flakes, chunks
0772		S31° 41.159' E18° 42.923'	**ESA** handaxe, 2 silcrete flakes
0782		S31° 41.159' E18° 42.927'	MSA silcrete flake and quartz core
0792		S31° 41.158' E18° 42.944'	Dispersed scatter of MSA silcrete flakes, 1 core
0802		S31° 41.170' E18° 42.955'	Silcrete core and MSA flake
0812		S31° 41.178' E18° 42.963'	MSA silcrete flake
0822		S31° 41.201' E18° 42.859'	Quartzite hammerstone, 4 MSA silcrete flakes
0832		S31° 41.181' E18° 42.820'	Dispersed scatter of a few MSA silcrete flakes and chunks
0842		S31° 41.163' E18° 42.810'	MSA silcrete flake
0852		S31° 41.154' E18° 42.803'	3 MSA silcrete flakes
0862		S31° 41.150' E18° 42.821'	ESA silcrete flake
0872		S31° 41.165' E18° 42.826'	Possible quartzite hammerstone

Table 1. Spreadsheet of waypoints and description of archaeological finds

Collection of photos from the proposed Mine Area

Figure 11. Scale is in cm

Figure 12. Scale is in cm

Figure 13. Site 2212. Context in which many of the remains were found

Figure 14. Scale is in cm

Figure 15. Site 2212. Context in which the remains were found

Figure 16. Scale is in cm

Figure 17. Scale is in cm

Figure 18. Scale is in cm

Figure 19. Scale is in cm

Figure 20. Scale is in cm

Figure 21. Site 2621. Scale is in cm

Figure 22. Scale is in cm

Figure 23. Scale is in cm

Figure 24. Scale is in cm

Figure 25. Site 2811

Figure 26. Scale is in cm

Figure 27. Site 2731

Figure 28. Scale is in cm

Collection of tools from the Plant Area

Figure 30. Hammer stone. Scale is in cm

Figure 31. Scale is in cm

Figure 32. Large core (Site) Scale is in cm

Figure 34. Scale is in cm Scale is in cm

Figure 33. (Site 3191). Scale is in cm

Figure

8.2 Palaeontology

According to Almond (2017), most of the proposed mining development area is covered by a thin veneer of Late Caenozoic superficial sediments that are underlain by ancient Precambrian rocks, some of which might contain fossil remains. The Late Precambrian carbonate bedrocks of the Widouw Formation (Gifberg Group, Gariep Supergroup) are metamorphosed, recrystallized and highly deformed, and therefore `very unlikely to contain any fossils' (Almond 2017:1).

Almond (2017) notes that there have been previous reports of sizeable stromatolites (fossil microbial mounds) within the Widouw Formation near Vredendal, some 10km or so to the east of the proposed new mine, but these records could not be confirmed.

Almond (2017:18) states that `no fossil remains of any sort' were recorded from any of the superficial sediments observed during the recent site visit to Farm 511 Welverdiend 511 (river alluvium, surface and subsurface gravels, sandy soils). The carbonate bedrocks are largely mantled by a range of Late Caenozoic superficial deposits (wind-blown sands, sandy soils, gravels, silcrete and calcrete pedocretes & alluvium) that are up to 2m thick and `all of low palaeontological sensitivity'.

9. COMMENTS FROM MUNICIPAL AUTHORITY AND REGISTERED CONSERVATION AUTHORITIES

Comments from CapeNature and the West Coast District Municipality are confined to biodiversity and planning issues. No comment on heritage related matters were received (refer to Appendix B).

10. CONCLUSION

10.1 Archaeology

Indications are that proposed mining of the ± 34ha dolomitic ore reserve on Farm Welverdiend No. 511, as well as construction and operation of a large plant facility, will impact negatively on archaeological heritage that will result in the irreversible loss and destruction of archaeological resources.

The majority of the archaeological resources documented during the study have been rated as having *low* (Grade 3C) significance, but Sites 3191, 3231, 3251, 3261, 3281, 3291, 3301, 3312, 3321, 3331, 3351, 3361, 3371, 3381, 3401 & 3421 in the proposed Plant Area have been graded as having potentially *medium* (Grade 3B) because of the context in which the finds were made (i. e. tool production areas). These *in situ* sites are mostly associated with heuweltjies that are dotted around the proposed logistical facility.

Measures to ensure the protection and conservation of potential Grade 3B archaeological heritage remains associated with heuweltjies areas are proposed.

Mitigation action proposed includes the preparation of a Development Heritage Management Plan (DHMP) to manage the activities and phases of development that may impact heritage resources within the application area (Higgitt 2017), establishment

of buffer zones around potentially sensitive archaeological areas (e. g. Sites 0592, 0632, 0652, 0682 & 0692), and monitoring of mining and site operations.

Although large numbers of archaeological resources (i. e. stone tools) were encountered throughout the study area, they are of limited importance due to their poor context, mostly occurring below the top soils on eroded surfaces. While the study has captured a good record of the archaeological record present in the proposed development site, no occupation or settlement sites were recorded and the majority of the remains most likely represent flakes and flakes debris. The remains documented during the study are consistent with the distribution of surface remains in the Knersvlakte region, where most of the occurrences encountered appear to be dominated by the MSA.

10.2 Palaeontology

According to Almond (2017:18), `the overall impact significance of the proposed mining development is inferred to be LOW because most of the study area is mantled by superficial sediments of low palaeontological sensitivity and the Precambrian bedrocks are almost certainly unfossiliferous. No further specialist studies or mitigation regarding fossil heritage are considered necessary for this project'.

11. RECOMMENDATIONS

With regard to proposed operation of a dolomitic limestone mine, and construction and operation of lime kilns on the Remainder of Farm No. 511 Welverdiend near Vanrhynsdorp, the following recommendations are made:

11.1 Archaeology

1. Mining of the 34ha ore reserve should be allowed to proceed, subject to the following conditions, which must be approved by Heritage Western Cape.

2. Buffer zones must be established around potentially significant archaeological remains in the proposed Plant Area, once the final layout of the logistical facility has been established.

3. A targeted collection of archaeological resources (i. e. Sites 3191, 3231, 3251, 3261, 3281, 3291, 3301, 3312, 3321, 3331, 3351, 3361, 3371, 3381, 3401 & 3421), must be undertaken in the Plant Area if buffer zones are not practical or feasible.

4. Buffer zones must be established around potentially significant archaeological remains that occur outside the footprint of the proposed Mine Area (i. e. Sites 0512 & Sites 3018-3111), and the proposed Plant Area (i.e. Sites 0592, 0632, 0652, 0682 & 0692).

5. A Development Heritage Management Plan (DHMP) must be implemented to manage the activities and phases of the development that may impact heritage resources within and outside, the mine application area. This will ensure no accidental or indirect impacts occur during all phases of the proposed development.

6. In order to ensure that heritage resources are not negatively impacted by mining operations and operation of the mine plant area, ongoing management and monitoring must be undertaken.

7. Should any unmarked human remains or ostrich eggshell caches be exposed or uncovered during prospecting, or trenching activities, these must immediately be reported to the contracted archaeologist (J Kaplan 082 321 0172), or Heritage Western Cape (Mr Andrew September 021 483 9543). Burials must not be disturbed until inspected by the archaeologist, or the Heritage Officer.

11.2 Palaeontology

1. Should substantial fossil remains (*e.g.* vertebrate teeth, bones, petrified wood, stromatolites, shells, trace fossils) be exposed during mining, the ECO should safeguard these, preferably *in situ*, and alert Heritage Western Cape (Mr Andrew September 021 483 9543) as soon as possible so that appropriate action (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist at the developer's expense

The above palaeontological and archaeological recommendations must be included in the Environmental Management Plan (EMP) for the proposed development.

12. REFERENCES

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Appendix A

Palaeontological Impact Assessment

Appendix B

Comments from registered conservation bodies and the local Municipality

CapeNature

SCIENTIFIC SERVICES

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date	**27 February 2017**

Ntsanko Ndlovu
Afrimat (Pty) Ltd

By email: ntsanko.ndlovu@afrimat.co.za

Dear Mr Ndlovu

RE: Application for environmental authorisation for an extension of a dolomitic limestone mine and construction of lime kilns on Farm Welverdiend No. 511, Vanrhynsdorp. – Pre-application Draft Scoping Report.

DMR Ref: TBA

CapeNature would like to thank you for the opportunity to comment on the amended Basic Assessment Report for this application and wish to make the following comments:

1. A portion of the site is located within a Critical Biodiversity Area (CBA) which has been determined to maintain ecological connectivity (along an important river corridor) and for meeting conservation targets. No mining should take place within the portion of the site determined to be Critical Biodiversity Area[1]. The main vegetation types on site are Vanryhnsdorp Gannabosveld and Knersvlakte Dolomite Vygieveld. Although Vanrhynsdorp Gannabosveld is not listed on the List of Threatened Ecosystems published in 2011, it is under significant threat from mining and agriculture and is poorly protected. Knersvlakte Dolomite Vygieveld is also not listed as a threatened ecosystem but even its' original extent was very small and it is has no formal protection.

2. Please note that there is a typo in the main report on page 27 where Bedford Dry Grassland is referred to. This vegetation type does not occur in the region where the application area is located.

3. Previous botanical site investigations conducted for mining applications on this property have shown that the site and surrounds has higher ecological importance in terms of Species of Conservation Concern (SCC) than initially thought. The most significant SCC found in the vicinity of the site is *Haemanthus lanceifolius* of which there is a sizeable population adjacent to the site. Although avoidance has been recommended by the specialist, this recommendation must be enforced by excluding

[1] Note that an updated Provincial Biodiversity Spatial Plan will be released in March 2017 and should be used as a key biodiversity informant when determining the location of mining activities. Until then the currently available 2014 Western Cape Biodiversity Framework data can be referred to.

WESKUS DISTRIKSMUNISIPALITEIT
WEST COAST DISTRICT MUNICIPALITY

Rig alle korrespondensie aan:
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28 February 2017

ATTENTION: NTSANKO NDLOVU
Email: ntsanko.ndlovu@afrimat.co.za

Afrimat (Pty) Ltd
PO Box 768
BELLVILLE
6850

Sir

DRAFT SCOPING REPORT: EXTENSION OF DOLOMITIC LIMESTONE MINE AND CONSTRUCTION OF LIME KILNS, FARM WELVERDIEND NO 551, VANRHYNSDORP, MATZIKAMA MUNICIPALITY

1. The Draft Scoping Report for the above-mentioned proposal, dated February 2017, refer.

2. The Air Quality Officer of the West Coast District Municipality has the following comments:

   2.1 An application for an Atmospheric Emission License must be submitted to the relevant competent authority in terms of Section 36(5)(e) of the National Environmental Management: Air Quality Act (Act 39 of 2004).

   2.2 The National Dust Control Regulations, no R827 dated 1 November 2013 must be complied with during the construction and operational phases of the development. A dust monitoring programme must be established to determine the potential increase of dust pollution of the activities.

   2.3 The Air Quality Officer reserves the right to call for additional requirements on receipt of specialist reports and the Environmental Management Programme (EMPr).

2/...