PGS HERITAGE

Phase 2 Specialist Study of affected Stone Age Locality on the ACWA Power SolarReserve Redstone Solar Thermal Power Plant

Site PGS06 – farm 469 "Humansrus" close to Postmasburg in the Northern Cape Province

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Declaration of Independence

The report has been compiled under contract to PGS Heritage an appointed Heritage Specialist for ACAWA Power SolarReserve Redstone Solar Thermal Power Plant (RF) Pty Ltd. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in this report.

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Commissioned by ACAWA Power SolarReserve Redstone Solar Thermal Power Plant (RF) Pty Ltd

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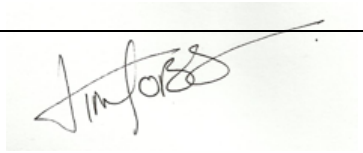
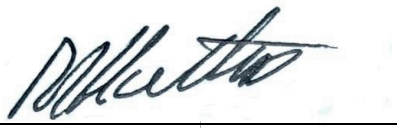
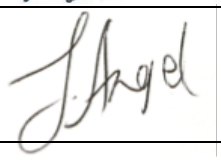
Author	Dr Tim Forssman		Principal Investigator – Stone Age
Author	Marko Hutten		Field Director - Archaeologist
Author	Jessica Angel		Field Supervisor - Archaeologist
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PHASE 2 SPECIALIST STUDY OF AFFECTED STONE AGE LOCALITY AFFECTED BY THE ACAWA POWER SOLARRESERVE REDSTONE SOLAR THERMAL POWER PLANT

EXECUTIVE SUMMARY

Purpose

This report details the results of a Phase 2 mitigation undertaken at a demarcated surface area of Site PGS06. The study was commissioned by PGS Heritage following on recommendations emanating from an Archaeological Walk Down and Heritage Impact Assessment (HIA) conducted by PGS [1.]

> *It is thus recommended that the site (PGS06) be documented through a surface collection and test excavation to determine the extent of the site. This wil include mapping of the lithic distribution as well as analysis of the lithic assemblage.*

This recommendation was accepted and expanded on in the final comments from the South African Heritage Resources Agency – Case: 2316, dated 5 February 2016.

> *Site PGS06 is generally protected in terms of Section 35(4) of the National Heritage Resources Act (Act 25 of 1999) and requires mitigation. The specialist will require a mitigation permit from the relevant Heritage Resources Authority. Mitigation should take the form of systematic surface collection and limited test excavation, to be undertaken before trenching and any other earth-moving activity resulting from this proposed project commence. The visible material boundaries of the sites to be mitigated must be surveyed with the aid of a surveying instrument and mapped. A photographic record must be established immediately before, during and after mitigation. On receipt of a satisfactory mitigation (Phase 2) permit report from the archaeologist, the heritage authority will make further recommendations in terms of the site, such as its final destruction or additional sampling.*

[1] *Fourie, W. 2011 Humansrus Solar Thermal Energy Power Plant, Postmasburg. Report compiled by PGS Heritage.*

Background

PGS Heritage & Grave Relocation Consultants was originally appointed by WorleyParson to undertake a Heritage Impact Assessment (HIA) that formed part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the Concentrated Solar Project for SolarReserve SA (Pty) Ltd, on the farm 469 "Humansrus" close to Postmasburg in the Northern Cape Province.

The field work identified a total of 25 heritage sites of which Site PGS06 was identified to require further mitigation. The site needed to be documented through a surface collection and test excavation to determine the extent of the site and the density of archaeological material. This include mapping of the lithic distribution as well as analysis of the lithic assemblage.

PGS Heritage (Pty) Ltd (PGS) was then appointed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF) Pty. Ltd. to perform the Phase 2 mitigation work at the identified site.

Following on recommendations for documentation of the site PGS06, PGS was appointed to facilitate the mitigation of the Middle Stone Age/Later Stone Age open air scatter. A permit was granted and the mitigation took place on the 10th – 14th October 2016.

This report details the results of the Phase 2 specialist study, and it describes the methodology applied in the assessment of the archaeological occurrences, provides an account of the sampling of the lithic collection and contextualizes the archaeological history of this part of the Northern Cape.

The results of the specialist study on the Stone Age lithics sampled at Site PGS06 are presented in the form of statistical analyses of the findings together with a synopsis of the typological and technological attributes of the Stone Age lithics.

Summary

The Phase 2 specialist study confirmed the presence of representative Later Stone Age (LSA) assemblage at locality PGS 06. Visits to the area by hunting and gathering groups over a long period of time created an overlay of episodic events that resulted in medium-density scatters of artefacts. A range of raw materials were used to produce the assemblages. During the initial scoping a rating of medium significance was assigned to this locality in view of the fact that relatively few open-air sites in the area have been scientifically recorded.

The methodology applied was to sample all lithics within the vicinity of PGS 06 (S28 18 19.0, E23 21

24.6) that will be negatively impacted by the proposed infrastructural development. In view of the relative low densities and the patterning, all the lithics were recorded with a Total Station. The lithics were then removed for analyses by Dr Forssman.

The sampled lithics (total n = 496) produced indices of 79% for debitage/waste (discarded material from the reduction process and from the shaping of tools), 13.6% cores (or objective pieces), and 6.5% formal stone tools for the surface collections and 95% waste, 2.2% cores and 1.9%formal tools for the excavated materials. All surface and excavated lithic elements had been collected from the designated squares, including small chips and spalls.

Establishing chronology only using stone tools is problematic. It assumes that stone tool chronological markers are a) reliable across time and space, b) represented enough to be dependable indicators (i.e. are not absent), c) that stone tool morphology represents shared styles and d) that we are viewing artefacts in similar phases of their use/wear/recycle/reworking life-cycle. These four factors are important to consider when determining chronology from stone material and even so make it problematic to be certain. Broad-brushed estimates are possible but are not reliable until absolute dating is used.

The large scrapers are not entirely unlike Oakhurst scrapers. These are typically large and made using coarse-grained material. Oakhurst assemblages are also thought to be macrolithic but there are microlithic components in the Redstone assemblage as well. This includes small scrapers and backed tools very alike Wilton period artefacts. This may indicate that the assemblage is a mixture of Oakhurst and later Wilton components; the presence of MSA artefacts certainly indicates some form of mixing has occurred. However, both Oakhurst and Wilton assemblages have a variety of tool types. The most likely chronological period is the last 500 years based on the similarities between the Redstone and Canteen Kopje assemblage. Until absolute dating is obtained, which is unlikely given that no organic material was found, this is only a suggestion and may need revision.

Conclusion

The site has now been subject to a full surface collection and the excavation of three squares. That only a small assemblage was recovered, which is believed to be representative, suggests that the site was not a substantial occupation camp. In addition, no datable material was identified meaning that determining the precise chronology of the site is not possible at this stage, and may not be even with further excavations since the deposit is so shallow. Mitigatory work conducted at the site is thus

sufficient and no additional work is deemed necessary.

It is our opinion that this document sufficiently documents the site PGS06 under permit Permit ID: 2385 as issued by SAHRA. The client can utilise this document as backing to apply for destruction of the site.

Qualifications

- All lithics at Site PGS 06 were recorded and subjected to a Specialist Study. Archaeological deposits usually occur below ground level. In the event that future construction activities reveal any buried sites or skeletal material, development activities should be halted and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (*cf*. National Heritage Resources Act (NHRA) Act No. 25 of 1999, Section 36 (6).
- A copy of this report will be lodged with SAHRA as stipulated by the NHRA Act No. 25 of 1999, Section 38 (especially subsection 4). The recommendations contained in this document will be reviewed SAHRA in order to consider the significance of Site PGS 06 prior to issuing a destruction permit.

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Glossary, acronyms, abbreviations and basic stone tool terminology

(Refer to **Annexure A** for extended stone tool terminology)

Archaeological remains can be defined as any features or objects resulting from human activities and which have been deposited on or in the ground, reflecting past ways of life and are older than 100 years.

Conservation as used in this report in relation to heritage resources 'includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance' (NHRA 1999: Act 25:2iii).

Cultural significance means 'aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance' (NHRA 1999: Act 25:2(vi).

Development means any 'physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being' (NHRA 1999: Act 25:2(viii).

Heritage. Heritage resources have lasting value in their own right and provide evidence of the origins of South African society. They are limited and non-renewable. The NHRA section 32, p. 55 defines these as an 'object or collection of objects, or a type of object or list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object'. These include historical places, objects of archaeological, cultural or historical significance; objects to which oral traditions are attached and which are associated with living heritage; objects of scientific value, fossils, etc.

NHRA. National Heritage Resources Act.

SAHRA. South African Heritage Resources Agency.

The Act means the National Heritage Resources Act, 1999 (Act No. 25 of 1999).

The Stone Age: ESA (Earlier Stone Age), **MSA** (Middle Stone Age), **LSA** (Later Stone Age).

Acronym	Term
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
HIA	Heritage Impact Assessment
LCT	Large Cutting Tools
LIA	Later Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
SAHRA	South African Heritage Resources Association
ka	Thousand years before present, a date
ky	Thousand years

1 BACKGROUND TO THE PROJECT

PGS Heritage (Pty) Ltd (PGS) was originally appointed by WorleyParson to undertake a Heritage Impact Assessment (HIA) that formed part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the Concentrated Solar Project for SolarReserve SA (Pty) Ltd, on the farm 469 "Humansrus" close to Postmasburg in the Northern Cape Province.

1.1 Introduction

The field work identified a total of 25 heritage sites of which the site **PGS06** was identified to require further mitigation. The site needed to be documented through a surface collection and test excavation to determine the extent of the site. This will include mapping of the lithic distribution as well as analysis of the lithic assemblage.

PGS was then appointed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF) Pty Ltd to perform the phase 2 mitigation work at the identified site on the renamed by ACWA Power SolarReserve Redstone Solar Thermal Power Plant (further referred to as the Redstone Project).

This report details the results of the Phase 2 specialist study, and it describes the methodology applied in the assessment of the archaeological occurrences, provides an account of the sampling of the lithic collection and contextualizes the archaeological history of this part of the Northern Cape.

The results of the specialist study on the Stone Age lithics sampled at P**GS06** are presented in the form of statistical analyses of the findings together with a synopsis of the typological and technological attributes of the Stone Age lithics.

The client aims to apply for destruction of the site with the backing of the Phase 2 document as proof of the completed mitigation requirements as stipulated in the SAHRA recommendation for case

1.2 Locality

Site PGS06 is situated on the farm 469 "Humansrus" close to Postmasburg in the Northern Cape Province (S28 18 19.0 E23 21 24.6). The site is situated approximately 30 kilometres west of Postmasburg on the southern side of the R385 tar road

Table 1: Coordinates of site corners

X	Y	Point number
23.35695877	-28.30531844	1
23.35693553	-28.30514733	2
23.35675703	-28.30516128	3
23.35678238	-28.30533425	4

The central portion of the property is undulating with the low-lying areas covered in grasveld. The areas to the west and east of the central flat lands is characterised by rising rocky ridges covered with shrubs and trees and this is the location of the identified site. The farm is currently being used for grazing by livestock and for the breeding of horses.

The site is situated on a low rise on the western side of the CSP foot print. The site is situated in a clearing between the shrub and grass land that characterises the rocky ridges in the western section of the study area. A medium density of MSA/LSA flakes, cores and waste are present in situ as identified during the Heritage Impact Assessment. A small scan of a 1m² produced between 20-40 flakes and cores.

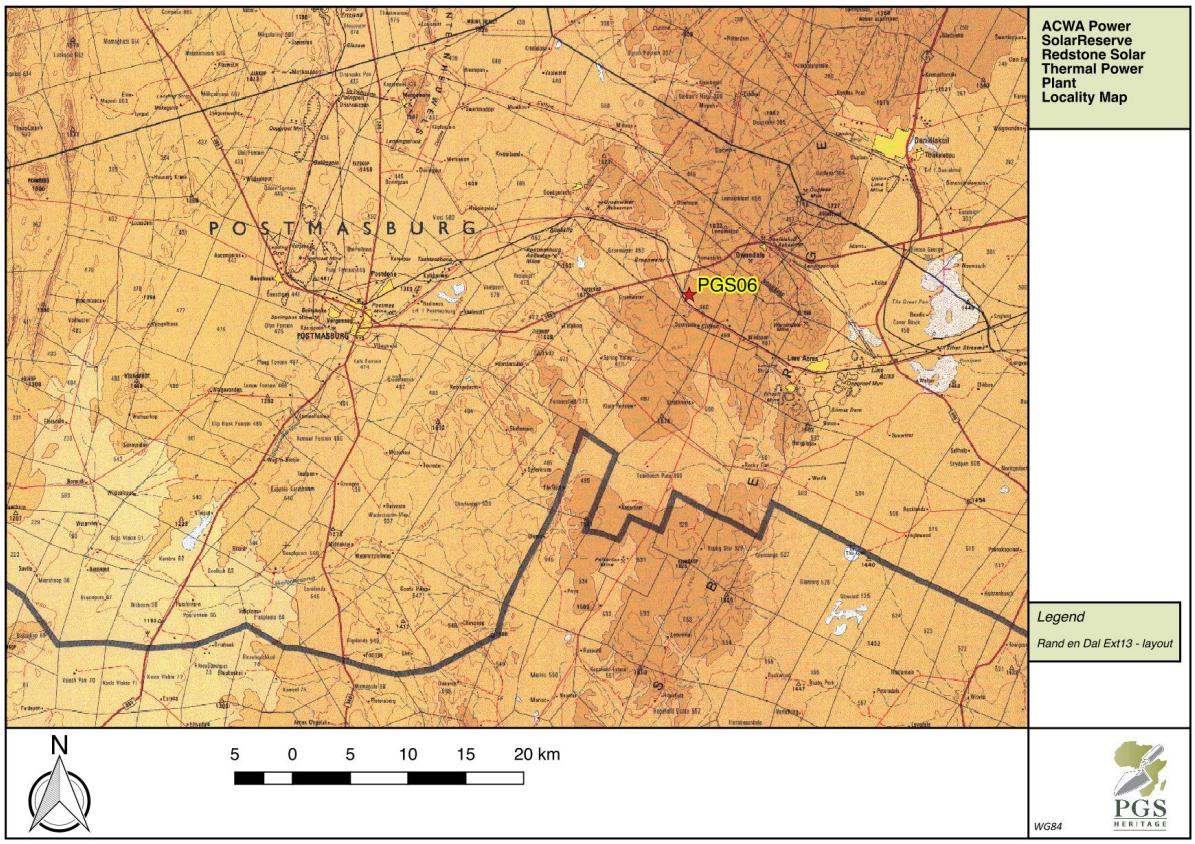

Figure 1: Regional Locality Map

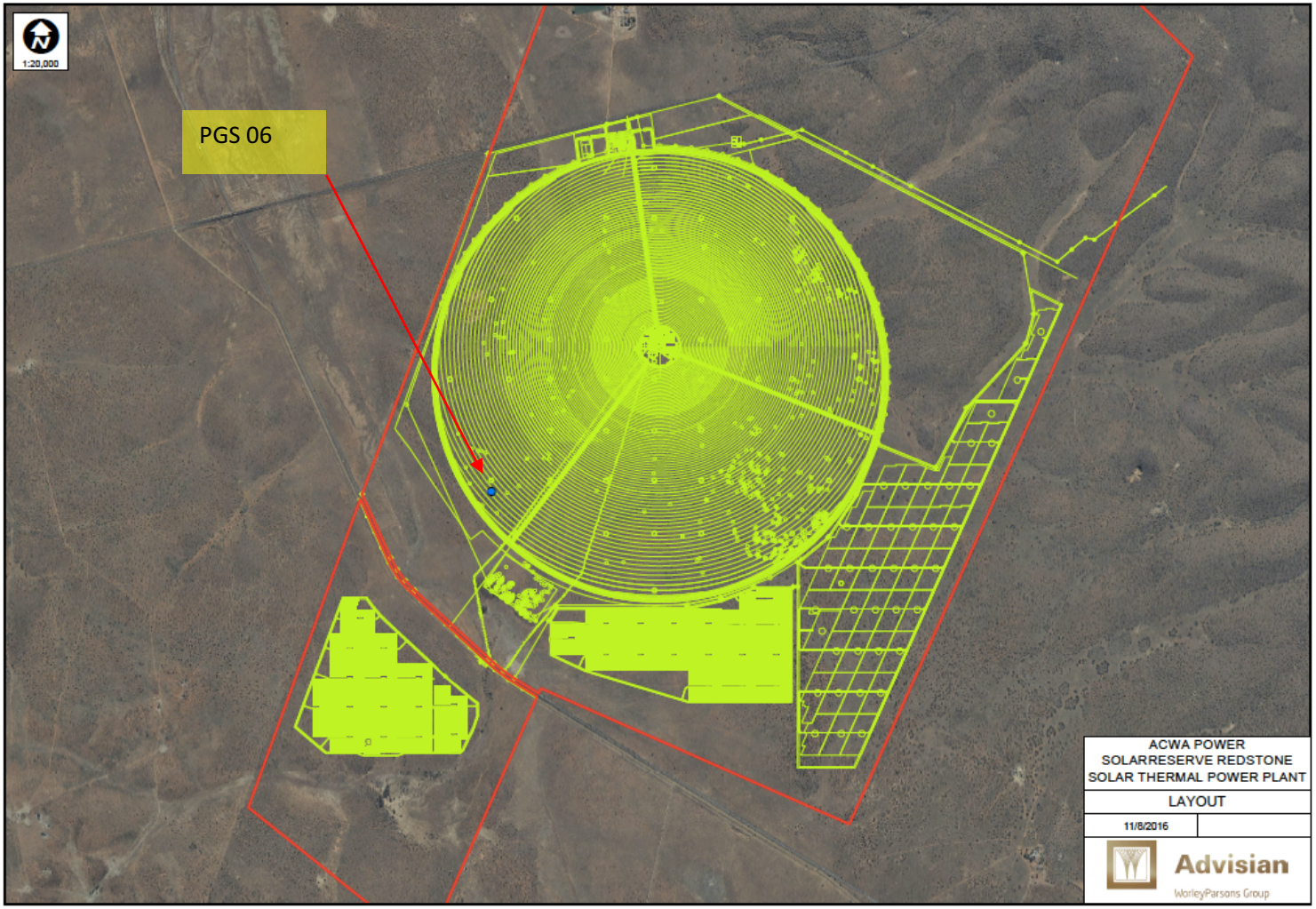

Figure 2: Site in relation to project footprint

1.3 Site description

The site is situated on a low rise on the western side of the CSP footprint. The site is situated in a clearing between the shrub and grass land that characterises the rocky ridges in the western section of the study area. A medium density of LSA and MSA scatter of flakes, cores and waste are present *in situ*. A small scan of a $1m^2$ produced between 20-40 flakes and cores

Site size: Approximately 5m x 5m.

Figure 3 : View of site from north

Figure 4: Collection of lithics from site

The site overlooks a pan and dry river bed, which points to a localised Stone Age hunting/lookout base. This interpretation is strengthened by indications of knapping (production of lithics) on site.

1.4 Terms of Reference

The terms of reference as dictated by the South African Heritage Resources Agency (SAHRA) and as accepted by the client are shown below:

"This permit is issued to Mr Wouter Fourie in association with Mr Cedric Poggenpoel[2] and Mr Marko Hutten to collect analyse surface scatter material at site PGS06 which will be impacted by the Humansrus Solar facility, near Danielskuil in the Northern Cape.

[2] Due to logistical arrangements and Mr Poggenpoel's availability, he was replaced by Dr Tim Forssman on the project team.

Conditions:

1. If the permit holder is not to be present on the site at all times then the heritage authority must be provided with the names and qualifications of the authorised representatives.

2. Adequate recording methods as specified in the Regulations and Guidelines pertaining to the National Heritage Resources Act must be employed. Note that the position of all objects collected must be marked on a plan of site.

3. A final report is due on or before 31 October 2017.

4. Reprints of all published papers or copies of theses and/or reports resulting from this work must be lodged with the heritage authority.

5. If a published report has not appeared within three years of the lapsing of this permit, the report required in terms of the permit will be made available to researchers on request.

6. It is the responsibility of the permit holder to obtain permission from the landowner for each visit, and conditions of access imposed by the landowner must be observed.

7. It is the responsibility of the permit holder to fill in excavations and protect sites during and after excavation to the satisfaction of the heritage authority and the landowner.

8. The heritage authority shall not be liable for any losses, damages or injuries to persons or properties as a result of any activities in connection with this permit.

9. The heritage authority reserves the right to cancel this permit by notice to the permit holder.

1.5 Methodology

The methodology for the documentation of the site and its resources is described below:

- The week of 10 to 14 October was set to perform the envisioned phase two mitigation work.
- The scope of work as prescribed by SAHRA formed the base of the work.
- The project was guided by Mr. Marko Hutten and assisted by Ms. Jessica Angel who managed the artefact collection and artefact accessioning. Messrs. Thomas Mulaudzi and Edward Khorommbi, were responsible for performing the artefact surface collection and the excavations of the identified squares as well.

- The site as identified during the HIA was re-identified/found through GPS-coordinates and photographs.
- The mitigation work started with the removal of vegetation to expose the areas of deflation where the artefact concentrations were the highest. An area of approximately 25 x 25 m was opened up.
- The areas of deflation were due to subsequent alluvial sheet erosion and/or some Aeolian processes. These areas of deflation were the areas of the highest concentrations of archaeological artefacts.
- A grid reference system was set out. The grid system had two by two metre squares which were laid out across the area where the most artefacts were exposed.
- The grid system covered the identified artefact assemblage and measured 8 x 12m in size.
- The grid was almost orientated from north to south. The grid is numbered A to D from west to east and 1 to 6 from north to south. The grid covered an area of approximately 100m².
- Surface artefacts were collected from each square as created by the established grid system.
- Each identified artefact was numbered and plotted through a Total Station.
- All lithics were systematically marked with nails and tags.
- After marking of the lithics the position of each lithic was surveyed by means of a total station to enable the development of a distribution map. (refer to **Annexure B** for survey data).
- Each lithic was given a reference as core (C) or flake (F) to facilitate the development of the distribution map.
- The squares with the highest concentration were subsequently documented through photographs that included close-ups of the lithics (refer to **Annexure C**).
- The lithics in each square were collected for analysis.
- Three squares with the highest concentration of lithics were identified for excavations. The three squares: B3, B4 and B5 were divided into quarters and one quarter of each square was excavated. These quarter squares measured 1 x 1m in size. Quarter 4 of each of the identified squares were excavated. The excavation was done by means of a trowel and brushes. Only one spit was excavated and it measured approximately 5cm thick as bedrock and sterile soils were encountered after approximately 5cm.
- The excavated material was screened (3mm screen) and the screened material was sorted and artefacts were recovered from sorting trays. These artefacts were not numbered individually as they were collected from the screens.
- All the collected lithics were brushed/washed to remove dust and other accretions and then rebagged according to position within the grid and labelled.

- Each bagged sample was decanted on a laboratory table. All lithics in the collection were subjected to typomorphological criteria. The lithics were provisionally sorted into classes, further subdivided according to categories, counted and bagged. The lithics were classified according to the currently accepted typological system (based on Deacon 1984a, 1984b; Wadley, 2005) and refined for site-specific attributes and technology.
- The data were logged in Excel spreadsheets and subjected to statistical analyses. An inventory of cultural material was drawn up.

2 ARCHAEOLOGICAL CONTEXT FOR THE NORTHERN CAPE AROUND DANIËLSKUIL

The purpose of the Phase 2 mitigation conducted for the Redstone project is primarily to gather information of past human activity, before the remains are to be permanently destroyed by ongoing development in the region.

Previous research conducted in the region needs to be considered if legitimate groundwork is to be conducted. Several studies have been conducted in the general area which will be discussed below. However, it is equally important to concern previous methods of research. Humphreys (1969) describes approaches to Stone Age archaeology,

> *"The archaeologist, concerned as he is with the past cultures of man against the background of his environment, has two main avenues of approach open to him: First, a 'static' approach, where he is concerned with behavioural patterns as detectable at specific times and places. How did the people live and what did they do at their various sites, whether they be temporary camp-sites, living-sites or whatever? This type of approach of necessity requires undisturbed primary context sites, for only if the artefacts are preserved as they were left can distribution variations among the artefact types, which reflect behavioural patterns, be detected. Second, the archaeologist has a 'dynamic' approach, where he tries to detect changes in these cultural patterns and their remains through the dimensions of space and time. He has to find some meaningful way of stringing his sites together."* (1969:200)

As Humphreys mentioned above, observation of all sites need to be assessed to gain a better general understanding of the archaeological activities in any area, how do the sites link together? How was the land being utilized by historical cultures? Relating to current mitigation in the Northern Cape, these questions are considered. The data gathered during this mitigation will contribute to the greater understanding of the Northern Cape prehistory.

Of course, it is not always possible to assess all areas as Humphreys suggests above as only areas under

immediate threat are being "rescued" whilst many of the remaining areas lie and wait for either funded research or further development to take place. However, many studies have been conducted in the greater region and a framework of understanding the Northern Capes Stone Age developed. For this study, the previous research will be presented as a base of understanding the Stone Age of the Northern Cape. Also, Humphreys' (1969) discussion on methods of archaeological research will be used to explain how the approach taken for PGS06, is valid and will provide a contribution to the existing data base of Northern Cape Stone Age research.

In the study and mitigation of PGS06, Humphreys (1969) notes that,

> *"In considering the problem of approach with regard to the Stone Age, it is important to look at the geographical conditions prevailing in the area to see what effects the environment has on the preservation of evidence. This background is, in this case, not to be regarded from the point of view of its influence on culture but purely as to the physical effects it would have on the survival of sites, whether they be Early, Middle or Later Stone Age. Main emphasis is, of course, being given to open sites as these constitute the vast majority of sites in this region. Geographical agencies and their effects upon the preservation of evidence must be understood lest their manifestation be confused with cultural variation."* (1969:200)

The site PGS06 was mitigated in isolation. Only the affected area was observed and tools from this area collected. Without serious consideration of previous work conducted in the surrounding area, one could conclude that the mitigation was futile as the tools without context are meaningless.

In Humphreys' 1969 paper on archaeological studies in the Northern Cape, he discusses Griqualand West specifically (this is the same area where PGS06 occurs). Humphreys concludes that the first method of approach as mentioned above is not the best method to follow as the combination of geology, vegetation and climate result in rapid run-off as sheetwash. Secondly, biotic interferences such as meerkats and other burrowing animals takes place. It was evident on PGS06 that grazing of cattle and other game also occur on the site. It is stated by Humphreys (1969) that in these conditions, the chances of survival of primary context sites are slim to none.

Therefore, the second approach, the dynamic approach is the suggested method of analysis as it is concerned with detecting changes through time and space and relating sites to each other. Humphreys describes the method of correlating sites in the area as consisting of two parts,

"one is stratigraphically, by relating sites in terms of the deposits in which the artefacts occur; and the other, on the basis of the artefacts themselves, typologically." (1969:201).

Researchers such as Mason (1962) have however pointed out the dangers of stratigraphic dating which Humphreys (1969) also points out. It is argued by Mason (1962) that the soils at most Stone Age sites in the Transvaal have been transported. The movement of the soils invalidates dating of stone artefacts. Mason (1962) further suggested that *'there is every possibility that some of the gravel-soil profiles containing Stone Age artefacts may post date the Stone Age'*. Humphreys (1969) states that the problems described by Mason apply equally in the Northern Cape.

As a result, this leaves us with the tools themselves. Humphreys argues that even the method of typological analysis has its own set of dangers. And as a rule "*contribution of the northern Cape to prehistoric studies must be determined by the nature of the sites that it yields. The conclusions reached in this area will have their own validity in terms of the area's particular conditions"* (1969:201). PGS06 has been assessed and lithics analysed accordingly to determine the importance of the site mitigated.

2.1 Archaeological History of the Area

2.1.1 Previous Studies

Researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a number of previous archaeological studies occur around the present study area. Previous studies listed for the area in the APM Report Mapping Project are listed in chronological order below:

- Morris, D. & Beaumont, P.B. 1994. **Ouplaas 2 Rock Engravings, Danielskuil.** An unpublished report by the McGregor Museum on file at SAHRA as 1994-SAHRA-0025.
- Morris, D. 1999. **Proposed Mining Areas and Properties at Ulco, Northern Cape, Including the Vicinities of Gorrokop and Groot Kloof.** An unpublished report by the McGregor Museum on file at SAHRA as 1999-SAHRA-0055.
- Beaumont, P.B. 2000. **Archaeological Impact Assessment: Archaeological Scoping Survey for the Purpose of an EMPR for the Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2000-SAHRA-0023.
- Morris, D. 2001. **Report on Assessment of Archaeological Resources in the Vicinity of Proposed Mining at Morokwa.** An unpublished report by the McGregor Museum on file at SAHRA as 2001-SAHRA-0078.
- Beaumont, P.B. 2004. **Heritage EIA of Two Areas at Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2004-SAHRA-0067.
- Morris, D. 2005. **Report on a Phase 1 Archaeological Assessment of Proposed Mining Areas of the Farms Bruce, King, Mokaning and Parson, Between Postmasburg and Kathu, Northern Cape.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0032.

- Beaumont, P.B. 2005a. **Heritage Impact Assessment of an Area of the Sishen Iron Ore Mine that may be Covered by the Vliegveldt Waste Dump.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0230.
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- Orton, J. and Walker, S. 2015. **Heritage Impact Assessment for a proposed 132 kV power line, Kuruman Magisterial District, Northern Cape.** Report for Savannah Environmental (Pty) Ltd. Accessed on SAHRIS 12 August 2014.

Researching the SAHRIS online database (http://www.sahra.org.za/sahris) further studies were identified in the vicinity of the study area:

- SAHRIS case number 1063. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for prospecting right in respect of manganese and sugillite on Portions 1 and 2 of the farm Curtis No.470, situated in Magisterial District of Kuruman, Northern Cape.**
- SAHRIS case number 1089. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Programme for a mining right in respect of manganese and iron ore on Erf 416, 417, 418, 419, 420, 421, 422, remaining extent of Erf 423, 424, 426, 493, 548, 549, (a portion of Portion 548), 550 (a portion of Portion 548), 551(a portion of Portion 548), 569, 679 (a portion of Portion 548), and 681 (a portion of Portion 548) of farm Dingleton township (now Dingle) 543 remaining extent of Portion 2 (Doornvlei), Portions 7, 11 (a portion of Portion 2) and 13 (a portion of Portion 2) of the farm Gamagara 541, remaining extent of Portion 19 (a portion of Portion 1), Portion 24 (a portion of Portion 19) and 25 (a portion of Portion 19) of the farm Sishen 543, remaining extent of Portion 2 (Parson a) and Portion 6 (a portion of Portion 2) of the farm Parson 564, remaining extent, remaining extent of Portion 2 (Grensplaat) and Portion 4 (Stuk) of the farm Fritz No.540, situated in the Magisterial District of Kuruman, Northern Cape region.**
- SAHRIS case number 1332. **Resources Development Act 2002, (Act 28 of 2002) for the approval of an amendment to the Environmental Management Programme for a mining right in respect of iron ore on Portion 2, 6 and the remainder of farm Parson Po. 564, Portions 1,2,3 and the remainder of farm King No. 561, Portion 3,4,5 and the remainder of Bruce No.544, Portion 1,2,3,4,5 remainder of Mokaning No.560 situated in the Magisterial District of Kuruman, Northern Cape.**
- SAHRIS case number 1402. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act of 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan in respect of borrow pits 1,2,3,4,5,6,7,8 & 9 on Portion 19 of farm 543, remaining extent and Portion 1 of Gamagara 541, Portion 1 and Portion 2 of Fritz 540, remainder of Nooitgedacht 469 and remainder of Lylyveld 545, situated in the Magisterial District of Kuruman Northern Cape region.**
- SAHRIS case number 1411. **Consultation of scoping report submitted in terms of Section 22 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) in respect of remaining extent of Portion 1 (Barnadene) of farm sims No.462, remaining extent of and remaining extent and remaining extent of Portion 2 (Rusoord) and remaining extent of Portion 3 (Portion of Portion 1) of Farm Sacha No.468, remaining extent of Portion 4 of the farm Gamagara No.541, remaining extent of Portion 1 (lot a) of the farm Sishen No. 543, situated in the Magisterial District of Kuruman.**

- SAHRIS case number 1505. **Environmental Impact Assessment and Environmental Management Programme.**
- SAHRIS case number 2516. **Consultation in terms of Section 40 of the Mineral and petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for mining permit for aggregate gravel on the remainder of the farm Galway No.431, situated in the Magisterial District of Kuruman, Northern Cape region.**
- SAHRIS case number 2769. **Proposed construction of 400kV transmission line from Ferrum substation (Kathu) to Garona substation (Groblershoop) in the Northern Cape.**
- SAHRIS case number 3029. **Proposed Development of 3 500 Erven on 280 Ha of Vacant Land on a Portion of Remainder of Farm Sekgame 461, Kathu.**
- SAHRIS case number 3157. **Consultation in terms of section 40 of the mineral and petroleum resources development act 2002, (act 28 of 2002) in respect of prospecting for manganese and iron ore on the farm Seldsden No.464 situated in the Magisterial District of Kuruman, Northern Cape Region.**
- SAHRIS case number 3615. **Proposed borrow pits associated with the upgrade of the Kimberley – Hotazel Railway Line**
- SAHRIS case number 3698. **Proposed relocation of the Vaal Gamagara water pipeline at the Sishen Iron Ore Mine.**
- SAHRIS case number 3701. **Proposed relocation of Rail and Associated Infrastructure at Sishen Iron Ore Mine.**
- SAHRIS case number 4456. **Proposed development of 380ha for residential uses, Kathu, Portion 175/1 and Portion 175/2, Joe Morolong Local Municipality, John Taolo District Municipality, Northern Cape Province.**
- SAHRIS case number 4785. **SAHRA comments for the Heritage Impact Assessment Report for the Kalahari Solar Power Project located on Famr Kathu 465, near Kathu within the Northern Province.**
- SAHRIS case number 4460. **Residential development on Remainder, and Portion 3 of Farm Bestwood 459 near the town of Kathu, Northern Cape.**
- SAHRIS case number 5323. **EIA and EMPr for the Proposed Solar CSP Integration Project: Project 2 - 400kV Power Line from Ferrum to the Solar Substation.**
- SAHRIS case number 5648. **The project will consist of the construction of an approximately 67km Double Circuit 400kV powerline from the Manganore Substation to the Ferrum Substation, including the construction of the new Manganore TX (Transmission) Substation adjacent to the existing Manganore DX (Distribution) Substation. The line runs in a northerly direction through areas of the Tsantsabane, Ga-Segonyana and Gamagara Local Municipalities in the Northern Cape Province.**

Most of the studies consulted located surface scatters of Stone Age artefacts (e.g. Dreyer, 2008a; Kaplan, 2008; SAHRIS case number 3029) if not actual Stone Age sites. They further note the wealth of Stone Age sites being a characteristic of the area, with few studies locating no heritage resources

(e.g. Beaumont, 2006; SAHRIS case number 1063; SAHRIS case number 2769; SAHRIS case number 5323) although in some cases this was possibly because the survey area had already been altered by mining activities (e.g. Dreyer, 2008b). Many studies referred to the famous Kathu Pan site, an ancient limestone sinkhole formation, discovered in 1974 during the establishment of the town of Kathu and renowned for both significant palaeontological (including specimens from up to 850,000 years BP) and Stone Age deposits from 500,000 BP onwards (e.g. SAHRIS case number 4785). Equally, a number of studies consulted referred to the Uitkoms 1 site on Kathu Hill with its huge number of Stone Age artefacts (e.g. SAHRIS case number 4785).

In a survey for the expansion of the Sishen Mine, Beaumont (2000) recorded surface LSA lithics which he stated were not associated with living sites. This study also listed the large number of Stone Age artefacts as well as two Iron Age collections from the near vicinity of the study area and accessioned in the McGregor Museum. Beaumont (2004) recorded only surface scatters of possible Acheulian lithics while later studies in approximately the same area located no heritage resources (Beaumont, 2005a; Beaumont 2005b) or, again, a few scattered stone tools of Middle Stone Age (MSA) appearance (Morris, 2008). Morris (2001) undertook a survey, locating a surface scatter of stone artefacts, but noting that the area between Postmasburg and Kathu is known for specularite workings and that any development should take cognisance of this. In another survey in the general area, Morris (2005) located scatters of stone artefacts on hills and plains, ceramic remains reflecting a Tswana settlement and four cemeteries.

Beaumont (2006) undertook a survey for the Kalahari Gholf en Jag development. While no significant new heritage resources were located in this survey the author referred to previous surveys and excavations undertaken on the properties involving nine archaeological sites. These included six of the Kathu Pan sites characterised variously by Late Pietersburg, Howieson's Poort, Wilton and Fauresmith technologies as well as LSA ceramics, the Kathu Townlands site, excavated in the 1980s and found to contain 10,000 Acheulian artefacts per cubic metre, and a Late Iron Age (LIA) site thought to be of Tswana origin (Beaumont, 2006). A later survey for the same development concurred with the findings of this report that most of the area was devoid of heritage resources.

In an extensive survey of two options for a power line route Dreyer (2007) noted the wealth of stone tool sites in the vicinity of Kathu, particularly extensive Earlier Stone Age (ESA) sites and the presence of the Kathu cemetery, suggesting mitigation measures to avoid these. A survey for the Kalahari Solar Power project located a number of Stone Age sites, surface scatters of Stone Age artefacts and referred to the possibility of significant sub-surface deposits of Stone Age artefacts in a number of localities (SAHRIS case number 4785). On the Ghaap Escarpment Morris (1999) identified LSA and MSA

lithics and referred to known rock painting sites at Groot Kloof. These paintings are of unusual quality and the most elaborate of their kind along the Ghaap escarpment (Morris 1999; SAHRIS case number 1505). Rock engravings at Limeacres consist of 119 distinct images spread over some 22 dolomite rock slabs and are interesting in that they are fairly recent, depicting colonial scenes such as horses with riders and were likely engraved by Korana people descendants of Khoekhoen pastoralists (Morris & Beaumont, 1994).

Van der Ryst and Küsel (2012) conducted a Phase 2 around a pan and surrounds for a proposed extension of the Sishen waste dump. Sampling of the lithics produced low to medium densities of MSA and LSA tool types on the plains and the periphery of the pan and surrounds. This is consistent with the results from several surveys as discussed above. Where Stone Age occurrences have been documented these are usually distributed either in fairly low scatters over large areas, or in very high densities where sources of in particular Banded Ironstone Formations (BIFs) outcrop. Surface sites around Kathu exhibit a palimpsest of prehistoric utilization and may contain lithics from all periods in the Stone Age succession.

It is therefore important to note a concern raised by Morris (2014: unpaged) that a "*consistent issue in the assessment of the presence or absence of archaeological deposits in and around Kathu … is the fact that the landscape is often capped by (1) calcrete (not uniformly ancient – Walker et al 2013) and (2) younger Gordonia Formation Aeolian sands (Almond 2014)*". That subsurface archaeological remains may occur under overlying soils and calcretes should be taken into account when archaeological and heritage surveys are undertaken. The clearing of topsoil during development activities frequently exposes archaeological deposits. In areas where BIFs outcrop there tends to be extremely high densities of lithics. BIFs are an excellent source of good toolstone. It was extensively used in the extraction of raw materials and the *in situ* manufacture of ESA Large Cutting Tools (LCT's) and for MSA assemblages. Significant exposures of siliceous BIFs in association with high levels of lithic production have been recorded at, for example, Kathu Townlands and Bestwood.

The LCT's from this area often contain very fine handaxes with some superb examples produced on banded ironstone. Lithics in some of the Acheulian deposits, but also in MSA levels, display a shiny silica skin. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. This phenomenon is ascribed to the use of the high-grade bedrock ironstone as a source for raw materials and is supported by the high incidence of handaxe roughouts (Beaumont, 2004b). The prepared core technique was used to produce the spectacular small handaxes, long blades, convergent flakes/points, scrapers found in Fauresmith collections.

The Kathu Complex sites contain important ESA Acheulian and transitional ESA/MSA Fauresmith assemblages (Beaumont, 1990, 2004, 2013; Herries, 2011; Chazan et al, 2012; Wilkins & Chazan, 2012; Walker et al, 2014). Walker et al (2014) suggest that the intensive occupation of the Kathu region can be linked to the availability of water resources. Current research projects are yielding important data on typologies, lithic technologies, technological innovations, complex spatial organization and also dates for the ESA Acheulian and for the MSA assemblages. Research at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores (Wilkens & Chazan, 2012). It is argued that some of these were used as speartips (Rots et al, 2014; Wilkins et al, 2015).

Archaeological and palaeo-environmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004b). Associated faunal remains with some of the Acheulian include *Elephas recki recki*. These animals disappeared at sites in East Africa such as at Olorgesailie, Kenya, at around 600 000/800 000 years ago (Beaumont, 2004b; McNabb, 2004). Biostratigraphy or faunal correlation is often used to date the southern African sites and gives some indication of the approximate age of some of the associated assemblages. More recently a combination of OSL and ESR/U-series dating (Porat et al, 2010; Herries, 2011; Walker et al, 2014) were used to date the transition to MSA tool forms. At Kathu Pan the transitional Fauresmith has been dated to ca. 500 000 BP (Porat et al, 2010). Kathu Pan is formed by a shallow depression with an internal drainage and a high water table.

North-east of Kathu several newly-found ESA sites with LCT's and an associated range of tools occur in sand quarries and on a hilltop at Uitkoms Farm and the Bestwood locality (Chazan et al, 2012). The residential and commercial developments at Bestwood and close to the Townlands demonstrate the importance of Phase 2 heritage studies in the Kathu region.

The concerns that Walker et al (2014:8) raise with regard to the impact of the exponential development should feature in any survey that is undertaken around Kathu. With reference to the general locality they urge that a "*broader landscape-based effort of subsurface testing including palaeo-landscape and paleo-environmental reconstruction is essential to our understanding of this extraordinary record. Sources of this information must be protected along with archaeological remains. Together with the other components of the Kathu Complex, this site represents a high density of hominin occupation that presents a challenge to reconstructions of hominin adaptations during the Early-Middle Pleistocene*".

Orton and Walker (2015:12) in remarking on the significance of Kathu again emphasize "*that the area*

is best regarded as an archaeological landscape rather than a collection of individual sites".

It is evident from the outline of previous archaeological and heritage studies in the surroundings of the present study area provided above that Kathu Pan represent a very significant archaeological site from this area. As a result, the Kathu Pan sites and their significance will be discussed in more detail below.

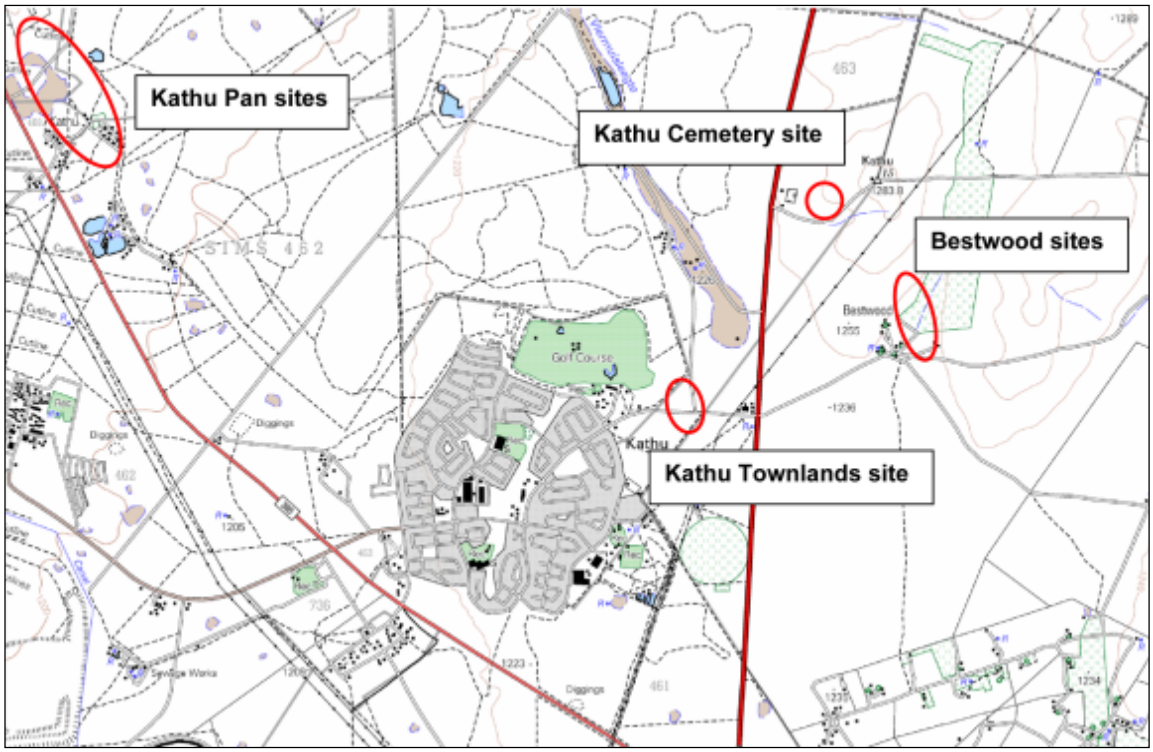

Figure 5: This map depicts the positions of the sites collectively known as the Kathu Archaeological Complex

2.1.2 The Kathu Pan Sites

The Kathu Pan has been described by Klein (1984) as the best paleo-environmental sequence from the Kalahari Basin area. It is a broad surface of organic marshland that is located in the centre of four farms (Marsh 467, Sacha 468, Kathu 465 and Sims 462), 15 km north of Sishen.

In the past the pan would have been maintained by artesian seepage rather than surface waters (Klein 1984). Due to this, Butzer (1984) maintains that from a sedimentological perspective the Kathu Pan is unique. He points out that the long term ground water trends provide a filtered climatic record that affords unique evidence for protracted climatic intervals during the Pleistocene. The particular environment provided a range of subsistence resources as pointed out by Van Zinderen Bakker (1995: 101).

> "*Since ESA times the water table at the pan has mostly been so high that, under natural conditions, it rises in summer above the peaty surface. This environment provided an oasis for prehistoric people and animal"*

However, since the extraction of ground water pumped to supply Kathu with water, the surface of this water body has not risen above the ground surface (Klein, 1984, Walker et al, 2013).

The pumping activities revealed a covered karst in the calcrete substrate of the Kathu Pan. Klein (1984) explains that although calcrete is commonly found 2-3m below the surface, an 8m drop of the water table due to excessive ground water extraction has led to compaction of the numerous doline fills with collapse and partial exposure of the sedimentary sequence.

Due to the above-mentioned processes, the Kathu Pans has become an incredibly significant archaeological site. In 1974, handaxes and faunal remains were discovered in the walls of a newly formed doline near the farmstead of then farm manager Naas Viljoen. Viljoen called the McGregor Museum when his children discovered the artefacts whilst playing in the doline (Walker et al, 2013).

The first archaeologist to conduct work on the Kathu Pan sites was A.J B. Humphreys on 13 August 1975. Subsequently, P.B. Beaumont conducted extensive studies in the vicinity. Beaumont began his initial research in the area just after he was appointed to the McGregor Museum in 1978 (Walker et al, 2013). During this year several researchers visited the site. These included botanist Andy Gubb, pollen scientist Van Zinderen Bakker, Professor van der Merwe (University of Pretoria) as well as John Vogel (The Quaternary Dating Research Unit (QUADRU)).

In the article written by Walker et al (2013), the history of research on the pan is made clear. Walker et al (2013) describe the official excavations at the site referred to as KP1 in 1980 as this is where most research at the pan sites have been conducted. Excavations were then undertaken at KP1 – KP5 in 1982. In 1983 KP5, KP6 and KP7 were excavated. In 1984, surface collections were undertaken at KP11. In 1985 KP6 and KP8 were excavated and KP9 was excavated in 1990. Also in 1990, KP10 was mechanically dug, however no archaeological excavations were conducted. During 1990 to 2004 there was a gap in the research conducted in the area. Thereafter, Dr Chazan and other members of the research team on the Kathu Pan conducted further excavations and research at the site. It was through this extended research and a re-examination of previous work that KP1 was declared as a Grade 1 site in 2013.

In 1990, P.B. Beaumont created a schematic map, which depicts the localities and details of 11 sites within the Kathu Pan. The current team researching the site used this map and geo-rectified it atop

the CDSM 1:50 000 map 2723CA (1972) in order to gain approximate GPS coordinates for each of the localities previously mapped by Beaumont.

A buffer zone has not yet been established around the Kathu Pan sites. According to Walker et al (2013) a considerable amount of fieldwork still needs to be undertaken to clarify the extent of the deposit. They noted that while the sink holes have offered windows into the deposits around the pan, and some excavations around the 1980s have offered clues to the deposits outside the sink holes, the overall extent of what the Kathu Pan sites have to offer is unknown.

The Kathu Pan is an exceptionally significant landscape, one of the reasons being that the archaeological deposits contain both ESA artefacts and associated fauna in near primary context (Walker et al 2013). This is unusual as only seven southern African sites contain ESA artefacts and bones in primary context (Cave of Hearths, Wonderwerk, Pomongwe, and the open air sites of Elandsfontain, Mwanganda, Namib IV and Kathu Pan) (Volman, 1984).

The second reason for the high significance of Kathu Pan is that it also includes stratified deposits from the MSA. Walker et al point out that most MSA sites are along the coast and in caves or shelters, whereas there are MSA deposits in an open-air setting in the interior at Kathu.

In conclusion, the Kathu Pan sites are of considerable significance due to the unique geology and formation of the dolines, which could be considered as windows into the past. Kathu Pan Site 1 contains a near perfect stratigraphy of the ESA, MSA and LSA that provides the best paleoenvironmental sequence from this area as well as a useful guide to archaeological events.

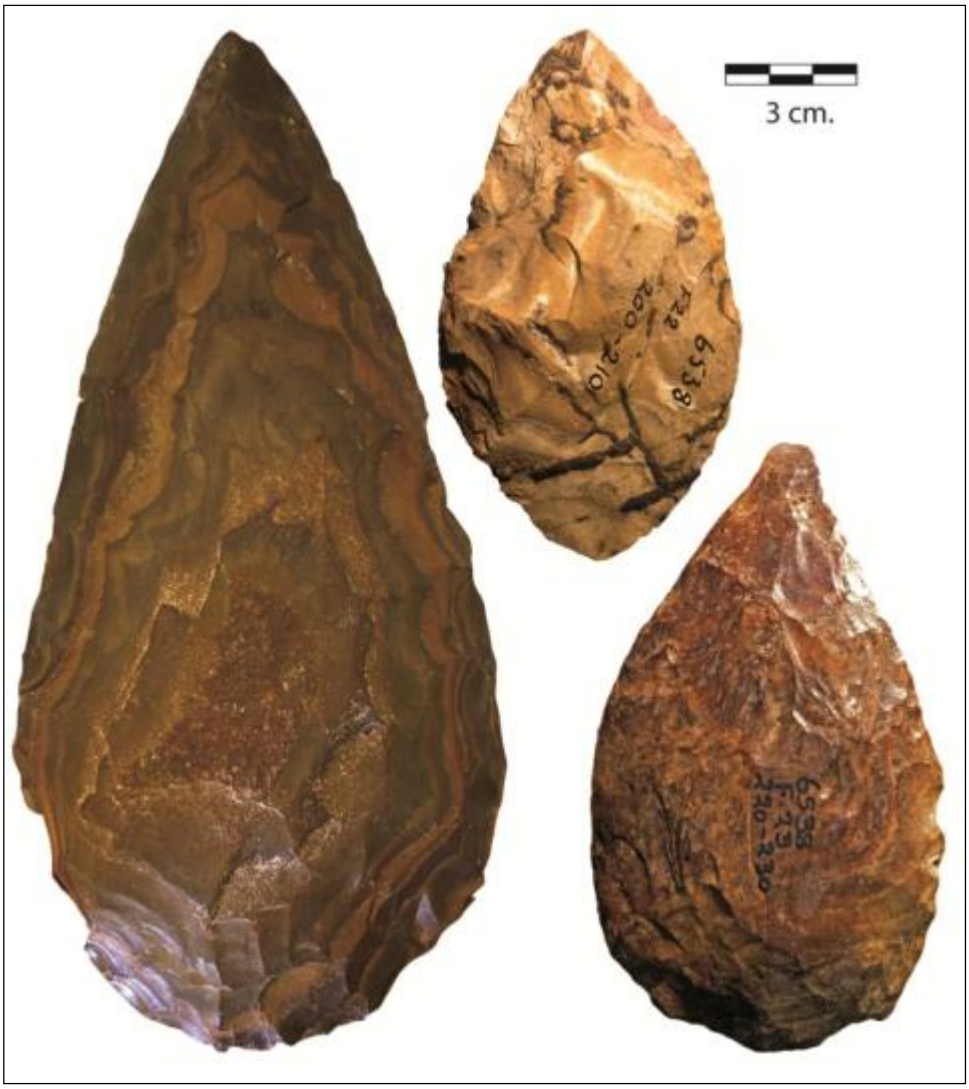

Figure 6: Three handaxes recovered from the Kathu Pan sites (Walker et. al. 2013:15)

2.1.3 Wonderwerk

Another important site to mention is that of Wonderwerk Cave. Wonderwerk Cave is a significant site characterised by continuous settlement from the ESA up to historical times. The ESA Acheulean lithics at Wonderwerk date to approximately 780 000 BP and are followed in sequence by MSA Fauresmith tools dating to between 276 000 and 510 000 BP and LSA Oakhurst industry replaced by Wilton industry tools (Beaumont & Vogel, 2006).

3 THE ANALYSIS

3.1 Methods

As describe in section 1.5 of this document the collection of artefacts was done through a formal grid system (**Figure 7**) and surface distribution documented with a total station (**Figure 8**).

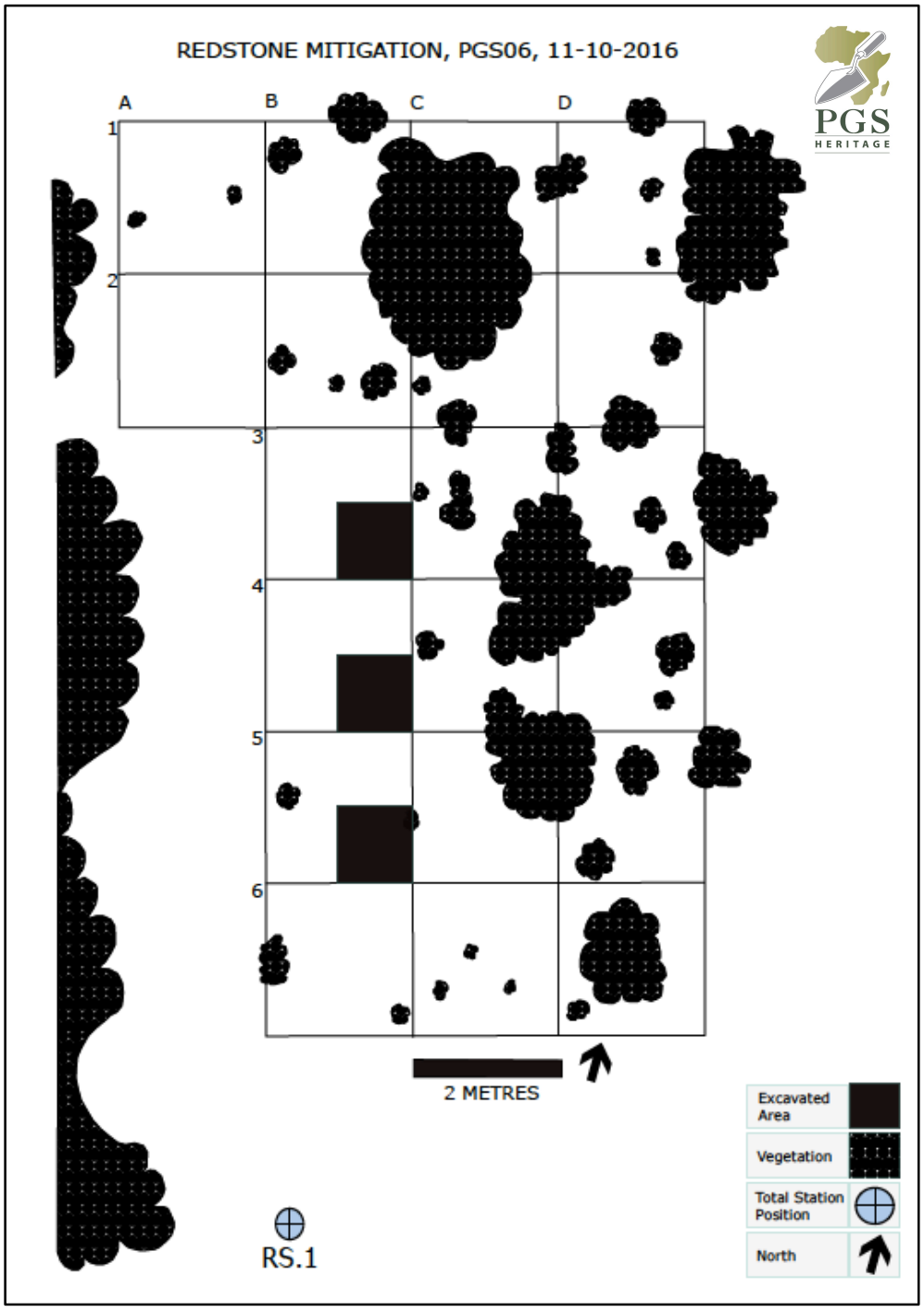

Figure 7: Site layout and grid system for PGS06

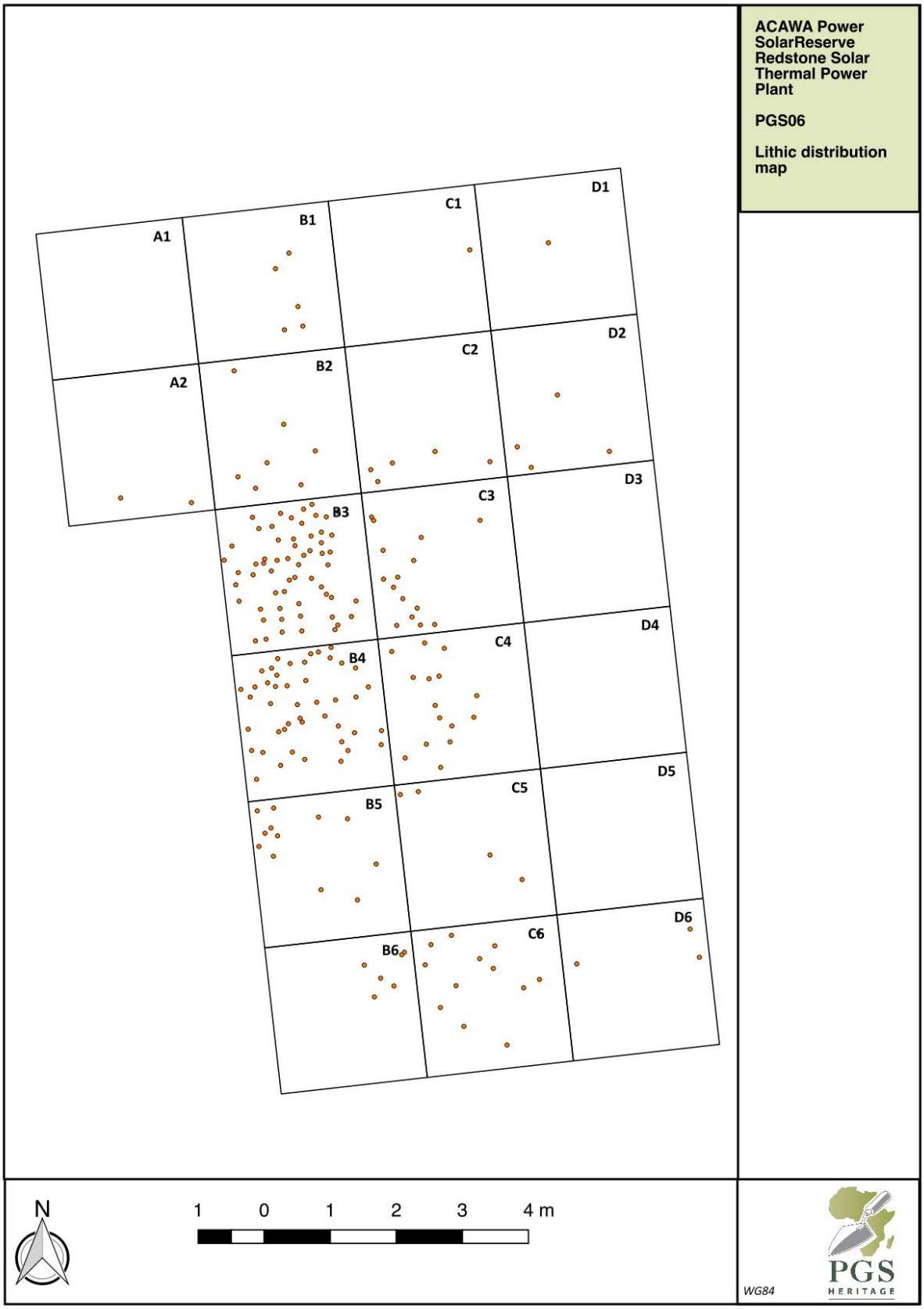

Figure 8: Surface distribution of lithics

All collected artefacts were individually inspected. Criterion recorded differed between the artefacts collected on the surface, which were point plotted, and those from the excavation. All surface artefacts were measured whereas only complete flakes, cores and formal tools were measured from the excavated assemblage. Measurements were taken from the striking platform to the opposite end of the tool (to assess whether flakes are end- or side-struck) and along the maximum breadth of the artefact. The degree of cortex per tool was measured (to help establish if primary working occurred at the site) and the presence of damage on the tool was noted. Edge damage was used to describe any damage along the edge of the tool whether it was from use or trampling. This helps with establishing site taphonomic processes (along with other indicators) and/or tool utilisation; both require additional and more detailed analyses but this low-level investigation provides an indication of whether these processes were present. These and other recordings (e.g. tool thickness and mass, worked edge, extent of retouching, presence of a bulb) would have been taken only if a technological analysis was undertaken, not deemed necessary in this case.

The stone tools were all placed into specific categories based on their morphological attributes and the presence, absence and location of secondary retouch. The typology used in this case was Deacon (1984a), the most widely used Later Stone Age typology, and for the Middle Stone Age Wurz's (2002; 2013) research. The terms used from these studies are included in the glossary.

All of the data was compiled into Excel spreadsheets where it was analysed (presented below). Selected stone tools were photographed with a Canon 700D and a Canon 100mm macro lens.

3.2 The stone tool analysis

In total, 496 stone artefacts were analysed. This excludes stones that were determined to not have been manipulated in any way (in other words, natural rocks that were recovered on the surface or in the excavations). From the surface collection 183 stone tools were identified whereas 313 were recovered from the three excavated squares (**Table 2**). Below the data is presented in terms of raw material, followed by waste (with cores and bladelets and blades discussed separately) and formal tools. This data and the distribution of the material assists with understanding the function of the site as well as its chronology.

Table 2: A summarised version of the entire assemblage from the surface collection and excavations.

	Surface		Excavation		Combined
Stone tool categories	**No.**	**%**	**No.**	**%**	**No.**
Waste	**145**	**79.78**	**300**	**95.85**	**445**
Chip	5		41		46
Chunk	4		40		44
Flakes	54		62		116
Rejuvenation flake	2		3		5
Broken flakes	71		143		214
Broken bladelet	4		3		7
Bladelet	3		6		9
Blade	1		2		3
Hammerstone	1		0		1
Cores	**26**	**13.66**	**7**	**2.24**	33
Irregular	12		2		14
Single platform	4		2		6
Casual	3		2		5
Radial	3		0		3
Prepared	1		0		1
Single platform bladelet	1		0		1
Split cobble	2		1		3
Formal tools	**12**	**6.56**	**6**	**1.92**	18
Side-side scraper (l)	2		0		2
Broken backed bladelet	1		1		2
Borer	1		0		1
Miscellaneous backed piece	1		0		1
Incomplete segmented backed bladelet	1		0		1
Circular scraper (l)	1		0		1
Side scraper (l)	1		0		1
End-side scraper (s)	1		0		1
End-side scraper (l)	1		0		1
End scraper (s)	1		0		1
Broken incomplete backed bladelet	1		0		1
Miscellaneous retouched piece	0		2		2
End scraper (l)	0		2		2
Backed bladelet	0		1		1
Totals	**183**	**36.90**	**313**	**63.10**	**496**

The majority of stone tools came from Squares B3 (n=55; 30.1%) and B4 (n=43; 23.5%). This is followed by 15 (8.2%) in C4, 14 (7.7%) in C3 and 11 (6%) in B5 (**Figure 9**). In all other squares a low density of

stone tools was recorded. The high density of material in Squares B3-5 led to an excavated unit being conducted within each of these squares. Square B4 contained the most artefacts with 116 (37.1%), followed by B3 with 108 (34.5%) and B5 with 89 (28.2%). However, all artefacts came from a single stratigraphic unit and so it cannot be established whether there is a change in the occupation intensity of the site over time, between units or across space.

The deposit was fairly shallow which compounds the situation. Since it is an open-air site on an elevated ridge, it is possible that there has been some disturbance to the site, further supported by archaeological indicators discussed below, and this would have altered the site's structure. That this is possible renders identifying any spatial differences impossible or at the very least seriously problematic. It is highly likely that artefacts have moved over time while exposed on the surface. Experimentation, however, has established that although site structure is altered by natural processes, central areas in the camp where large amounts of materials accumulate may still represent an area of increased activity (see Forssman & Pargeter, 2014). Thus, if the distribution of archaeological material is reliable (and an extensive taphonomic study would be needed to definitively state this) Squares B3 and B4 may represent the area of greatest activity within the site.

3.2.1 Raw material

Seven different types of raw material were recorded (**Figure 10**). The most frequent are crypto crystalline silicates (CCS) with a combined total of 53.4% (n=265), followed by Ventersdorp lava (VDL) at 28.2% (n=140). All other categories – dolerite (DOL), quartz (QZ), quartzite (QZT), fine-grained materials (FGM) (these exclude CCS) and banded ironstone (BIS) – occur in low frequencies. Of them, fine-grained materials are the most frequent but was identified in less than 20% of the surface assemblage (n=31) and 10% in the excavated assemblage (n=14). Therefore, it is the CCS and VDL raw materials that were most heavily utilised (see **Table 3** for additional information). That these two raw materials were favoured might provide additional information regarding the chronology of the site.

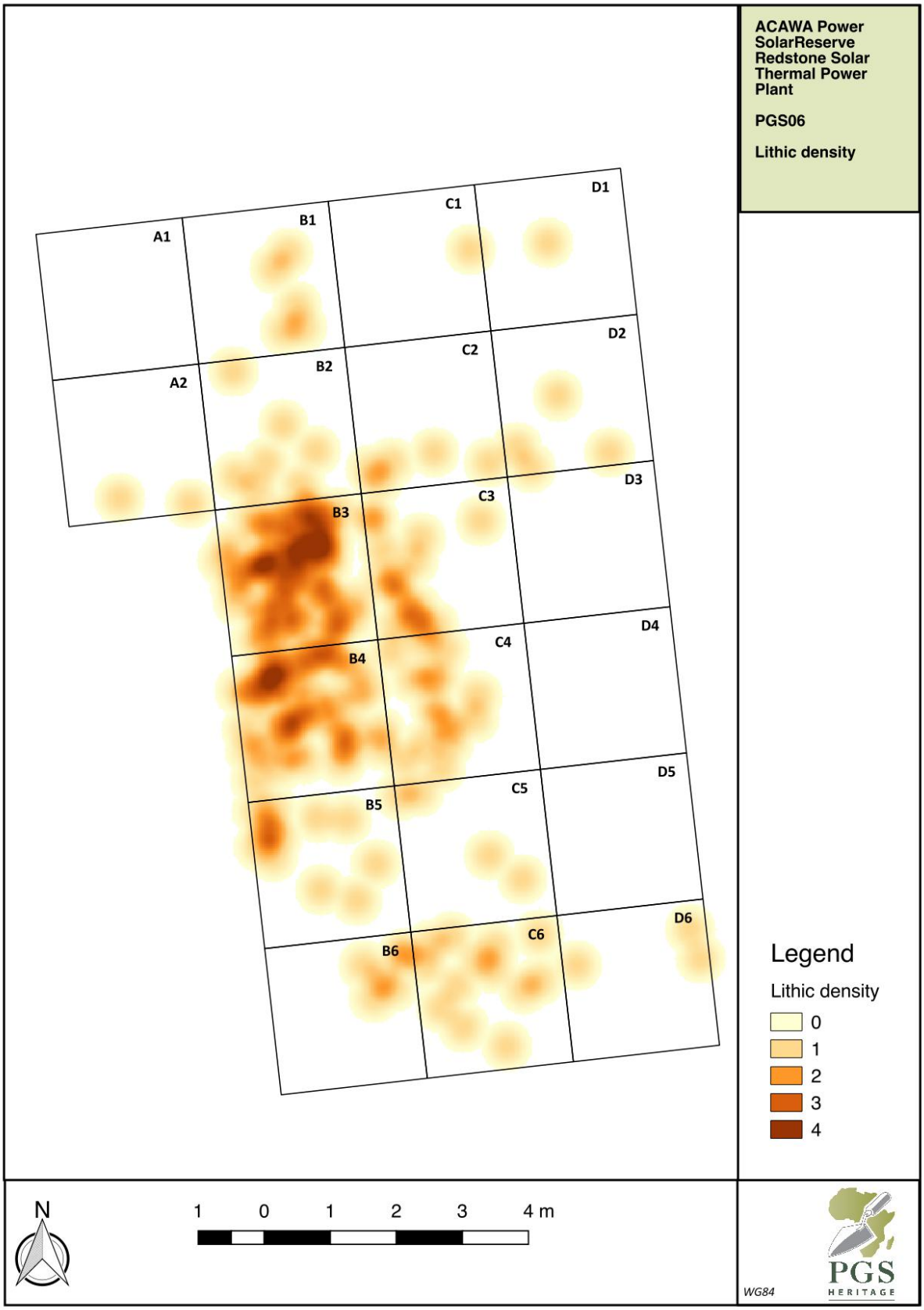

Figure 9: Lithic density

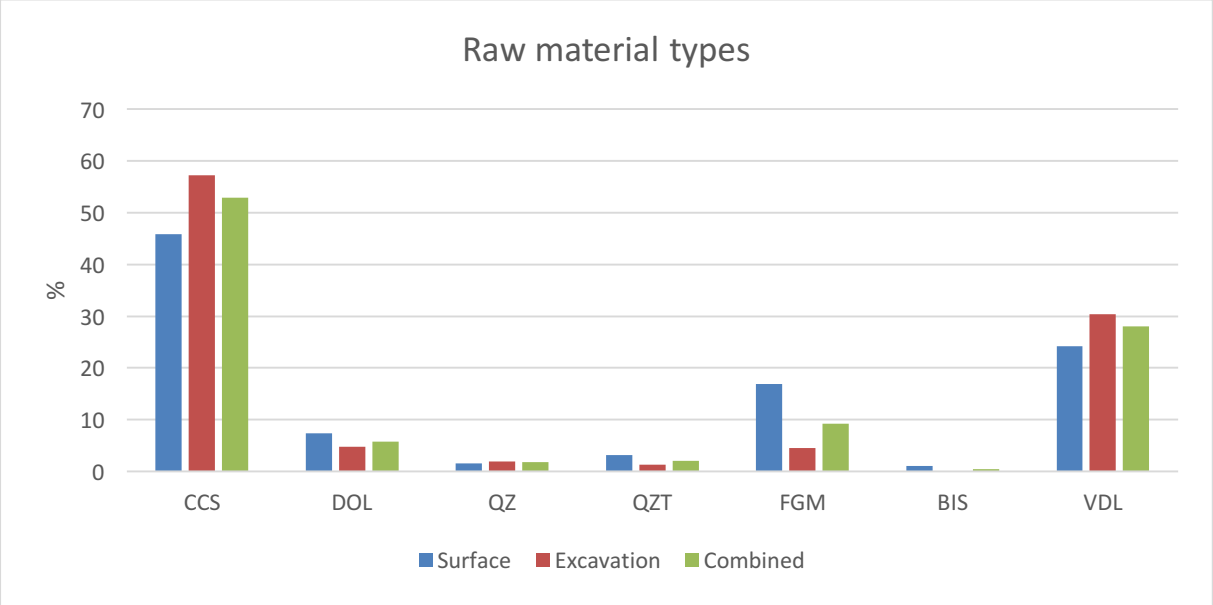

Figure 10: The representation of raw material types in the assemblage. CCS dominates followed by VDL

Table 3: Raw material utilisation between the surface and excavated assemblages

Raw material	Surface		Excavation		Combined	
CCS	86	46.99	179	57.19	265	53.43
VDL	45	24.59	95	30.35	140	28.23
FGM	31	16.94	14	4.47	45	9.07
DOL	13	7.10	15	4.79	28	5.65
QZT	5	2.73	4	1.28	9	1.81
QZ	2	1.09	6	1.92	8	1.61
BIS	1	0.55	0	0.00	1	0.20
Totals	**183**		**313**		**496**	

If one only considers formal tools (n=18) and cores (n=33) a slightly different pattern emerges. In the latter category, the distribution of raw material types is similar to the combined distribution. Most cores were made from CCS with 51.5% (n=17), followed by FGM with 21.2% (n=7), VDL with 18.2% (n=6) and lastly DOL with 9.1% (n=3). However, in the formal tool category CCS dominates considerably with 83.3% (n=15). This is noticeably higher than the representation of CCS in the overall excavated (57.2%) or surface (47%) assemblages. There is only one formal tool made from DOL, FGM and VDL each (5.6% each). This suggests that although a variety of materials were worked, as is evident

in the overall assemblage and the similar distribution of materials in the core category, the preference in terms of finished products was for CCS tools. This is not unlike many other LSA assemblages from southern Africa as well as those from the region (e.g. Parsons, 2008; Forssman *et al*. 2010; Orton, 2012).

If one examines the complete flakes (which includes flakes, unretouched blades and bladelets and core rejuvenation flakes) within each raw material type it shows that VDL was used to produce larger materials than all other materials. On average in the surface and excavated assemblages VDL flakes are 41.3mm and 42mm respectively. In contrast, CCS is 25mm and 22.5mm in those same assemblages. The sample size of the remaining materials is too small to draw any meaningful conclusions. Thus, as would be expected, the course-grained VDL and fine-grained CCS were used to produce different sized tools. In fact, the largest scraper in the assemblage (from B4 Q4 L1) was produced using VDL (71.5mm) but large CCS, FGM and DOL scrapers were also identified.

Therefore, a variety of raw materials were used. Since their distribution in the region is unknown it is not possible to say how far they were being sourced from. Jasper was also noted but no diagnostic artefacts produced using this material were recorded despite there being a large jasper deposit in the vicinity. Nevertheless, the evidence indicates that even though a variety of materials was used, CCS was preferred and most of the formal tools are of this type. I now consider the typological classes of the assemblage

3.2.2 Waste

Waste includes all non-formal tool types (tools that exhibit secondary working) or tools with clear and extensive utilisation damage (Walker, 1994). Here cores and blades and bladelets (unmodified) will be discussed separately with other waste categories.

Chips (<10mm in length) are a useful indicator of taphonomic processes and primary manufacturing. A large number of chips may suggest that primary working of stone tools was occurring on site. This means that tools were being worked from stones in their original form. It might also suggest that minimal disturbance has occurred at the site since when water action has affected a site small flaking debris and artefacts are removed first (see Kuman & Field, 2009). In the surface assemblage chips make up 2.7% and 13.1% in the excavated assemblage. In total, they account for 9.3% of the overall assemblage. This is particularly low. Had primary working taken place at the site one would it expect this to be between 40% and 70%. Therefore, based on the low proportion of chips the site does not seem to have been a primary manufacturing site, but cores need to be considered as well (see below). It appears that small artefacts were removed from the site by natural forces. If we examine the size

of the surface assemblage, we see that in the 1-20mm maximum length range there are 57 artefacts which accounts for 31.1% of the assemblage. In the excavated assemblage, of the measured tools only 18 are less then 20mm in length which represents 23.1% of the measured assemblage (n=78). In both cases this is particularly low and suggests that the small size classes have been removed from the site.

Broken flakes in both assemblages represent the most frequent waste category, with 38.8% (n=71) in the surface assemblage and 45.7% (n=143) in the excavated one (overall n=214; 43.2%) (see Table 1). There are various reasons why there may be a high broken flake component but typically this category is well represented in LSA assemblages. In other words, it is not unusual for assemblages to have a large component of broken flakes. Flakes can break during production, in use or after deposition. To determine this a technological and taphonomic study is required. It is possible that flakes were broken from animal trampling and edge damage (which includes trampling) was recorded on 50.8% (n=93) of the surface artefacts and 64.1% (n=50) of the measured excavated assemblage. Therefore, it is very possible that the assemblage has been heavily influenced by trampling.

Fewer flakes were recorded in the surface (n=54; 29.5%) and excavated (n=62; 19.8%) assemblages but they were fairly well represented. Of interest is the percentage of complete versus broken flakes in the VDL and CCS categories. In the latter, broken flakes represent 38.1% (n=101) of the overall assemblage whereas flakes make up 23% (n=61). This indicates a ratio of 1 flake per 1.7 broken flakes. In the VDL category, broken flakes make up 52.1% (n=73) of the assemblage and flakes 35% (n=49) with a ratio of 1 flake per 1.5 broken flakes. It therefore seems that a greater proportion of CCS flakes break than VDL which is perhaps to be expected since VDL is a harder material.

3.2.3 Cores

In total 33 (6.7%) cores were recorded, suggesting some stone tool manufacturing was occurring at the site. The extent of manufacturing, however, is uncertain. There are three lines of pertinent data to consider. Firstly, cores are fairly large. In the surface assemblage they average 51.4mm whereas in the excavated assemblage this is slightly less at 40.4mm. That they are sizeable indicates that they would be minimally influenced by water action when compared to chips. Second, the low chip count may further indicate that primary production would not have been present at the site. This would only be the case if it were possible to show that limited removal of artefacts occurred but because both chips and cores occur in low numbers (and cores would not have been removed by water as extensively as chips) supports the notion that primary production was not occurring here.

Lastly, the lack of cortex may suggest primary manufacturing took place elsewhere. In the surface assemblage 69.9% (n=128) contains no cortex at all and in the measured excavated assemblage this is

51.9% (n=40). In the former 94.5% of the tools and in the latter 82.1% have under 40% cortex. In assemblages that have considerable and extensive working cortex is rare whereas when primary knapping took place the degree of cortex present on tools is far higher. Therefore, based on this it is possible that primary manufacturing took place elsewhere and secondary flaking occurred on site. It is not possible to definitively explain the lack of chips and cores because it may be as a result of primary manufacturing occurring elsewhere or taphonomic processes.

Figure 11: Prepared core (scale = 1 cm)

3.2.4 Blades and bladelets

Lastly, worth noting is the low frequency of unretouched blades and bladelets including broken forms (n=19; 3.8%). That so few were identified seems to preclude the assemblage as belonging to the Robberg Industry, dating from c. 18,000 to 12,000 BP (Mitchell 1997). This industry is characterised by a high frequency of unmodified bladelets which dominate the tool categories (Mitchell, 1995). It is clear that this is not the case here even if one was to take into consideration the backed tool component, of which there are only 4 (0.8%).

Figure 12: Bladelets (scale = 1 cm)

3.2.5 Formal tools

In total 18 formal tools were identified which represents 3.6% of the assemblage. There is a noticeable difference in the tools coming from the surface (n=12; 6.6%) and excavated (n=6; 1.9%) assemblages. Typically, one would expect anywhere from 1% to 4% in formal tools, but this does not mean that some assemblages will not have more or less. The high number of tools in the surface assemblage may be related to visibility rather than over-representation within the assemblage. Tools, for example, are more noticeable than small debris and are far more diagnostic or easily identified than other tool types. Therefore, the numeric difference may be a reflection of tool collection strategies and not in site use.

In the surface assemblage two large side-side scrapers were identified and a broken backed bladelet,

borer, miscellaneous backed piece, incomplete segmented backed bladelet, large circular scraper, broken incomplete backed bladelet, and a small and large end scraper. Scrapers are the most common tool form (n=7) and were found in a variety of shapes. Most, however, were large (>30mm) and three exceeded 50mm in length. These types of large scrapers are common in Oakhurst assemblages (e.g. Deacon 1984b) but have also been found in LSA assemblages dating from the mid-second millennium AD (Forssman *et al*., 2010). This was recorded at Canteen Kopje where excessively large scrapers and adzes were identified and radiocarbon dates placed the site's occupation around 400 BP (**Figure 16**).

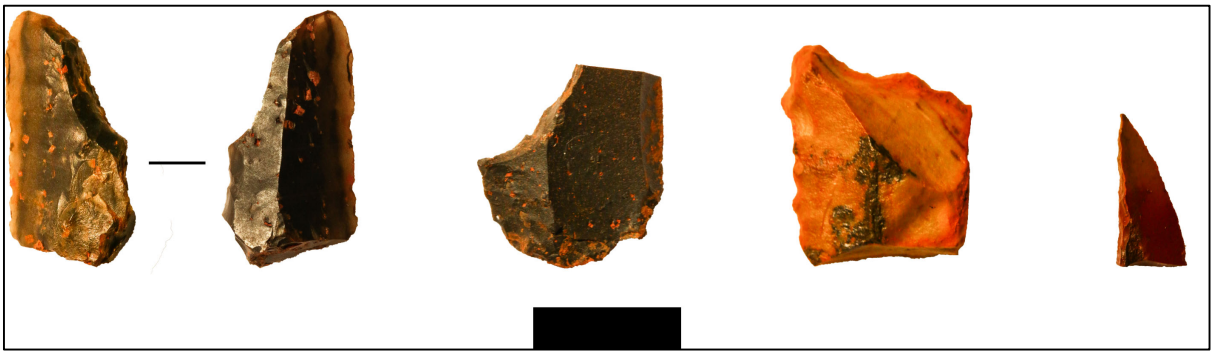

Figure 13: Backed tools and borer (scale = 1 cm)

Figure 14: Flakes (scale = 1 cm)

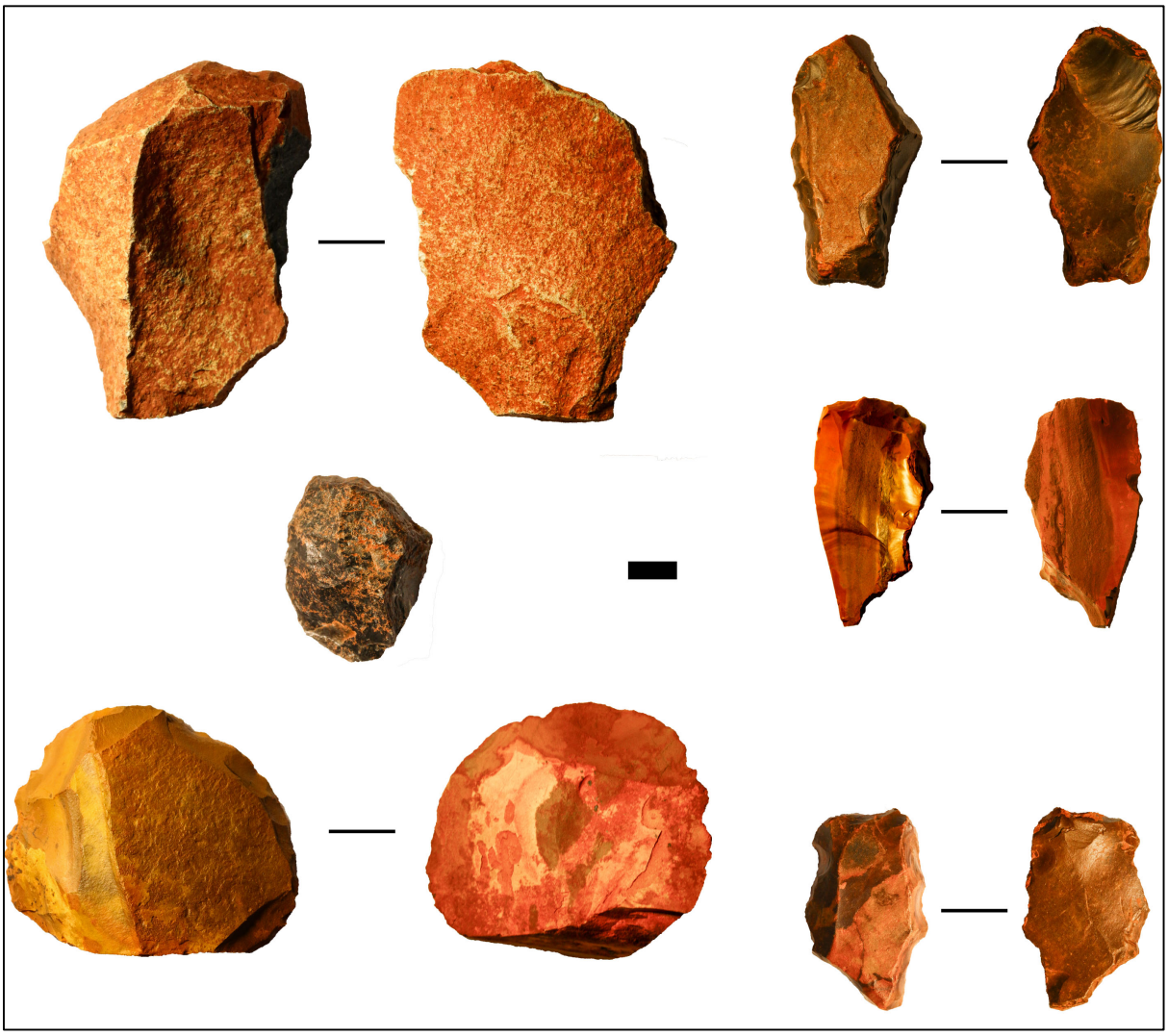

Figure 15: Scrapers (scale = 1 cm)

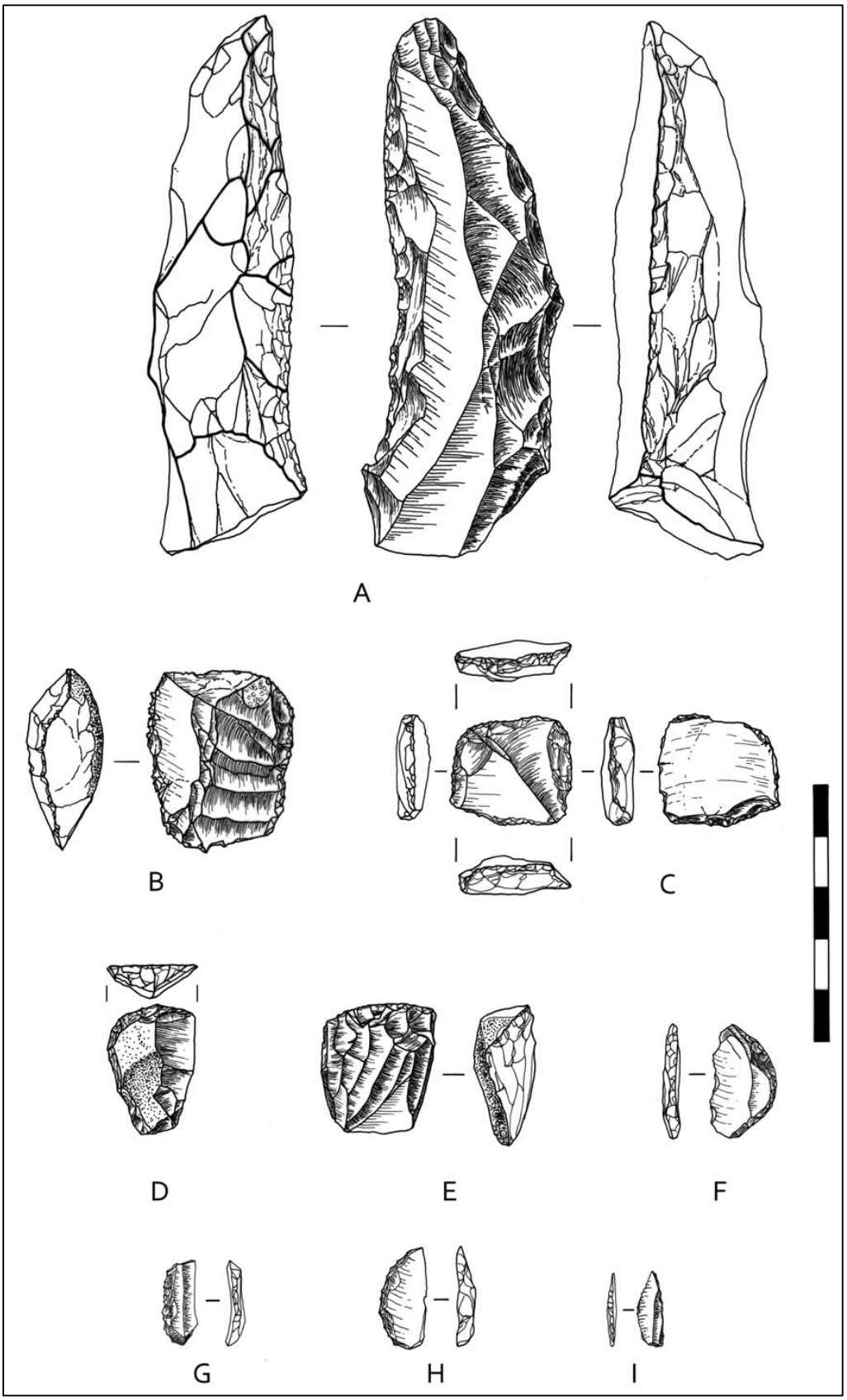

Figure 16: Examples of large scrapers from Canteen Kopje, very similar and on the same material as from Redstone (scale = 5 cm) (from Forssman *et al.*, 2010: 210).

In the excavated assemblages, two large end scrapers, two miscellaneous retouched pieces, a backed bladelet and a broken backed bladelet were found. The assemblage is particularly small and little can be said. The two scrapers are made of CCS and VDL and the latter is the largest scraper in the entire assemblage measuring 71.5 mm. According to Andrefsky (2005), the longer a camp is occupied for the greater the accumulation and diversity of stone tools. While this assemblage exhibits some tool diversity, the limited assemblage may indicate that the site was not a major living camp but rather a temporarily occupied camp. Further supporting this is the absence of material culture other than stone tools. However, taphonomy would need to be taken into account to determine whether this was because of the way the site was used or if natural processes have altered the archaeological assemblage and led to a disappearance of organic and other material. It is also possible, although debateable, that the site represents a dispersal camp of some kind as described by Brooks and Yellen (1987), but this should be subject to scrutiny.

3.3 Chronology

Establishing chronology only using stone tools is problematic. It assumes that stone tool chronological markers are a) reliable across time and space, b) represented enough to be dependable indicates (i.e. are not absent), c) that stone tool morphology represents shared styles and d) that we are viewing artefacts in similar phases of their use/wear/recycle/reworking life-cycle. These four factors are important to consider when determining chronology from stone material and even so make it problematic to be certain. Broad-brushed estimates are possible but are not reliable until absolute dating is used.

The large scrapers are not entirely unlike Oakhurst scrapers. These are typically large and made using coarse-grained material. Oakhurst assemblages are also thought to be macrolithic but there are microlithic components in the Redstone assemblage as well. This includes small scrapers and backed tools very alike Wilton period artefacts. This may indicate that the assemblage is a mixture of Oakhurst and later Wilton components; the presence of MSA artefacts certainly indicates some form of mixing has occurred. However, both Oakhurst and Wilton assemblages have a variety of tool types. The most likely chronological period is the last 500 years based on the similarities between the Redstone and Canteen Kopje assemblage. Until absolute dating is obtained, which is unlikely given that no organic material was found, this is only a suggestion and may need revision.

4 CONCLUSION

The site has now been subject to a full surface collection and the excavation of three squares. That only a small assemblage was recovered, which is believed to be representative, suggests that the site was not a substantial occupation camp. In addition, no datable material was identified meaning that determining the precise chronology of the site is not possible at this stage, and may not be even with further excavations since the deposit is so shallow. Mitigatory work conducted at the site is thus sufficient and no additional work is deemed necessary.

It is our opinion that this document sufficiently documents the site PGS06 under permit Permit ID: 2385 as issued by SAHRA. The client can utilise this document as backing to apply for destruction of the site.

5 QUALIFICATIONS

1. All lithics at Site PGS06 were recorded and subjected to a Specialist Study. Archaeological deposits usually occur below ground level. In the event that future construction activities reveal any buried sites or skeletal material, development activities should be halted and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (*cf*. National Heritage Resources Act (NHRA) Act No. 25 of 1999, Section 36 (6).
2. A copy of this report will be lodged with SAHRA as stipulated by the NHRA Act No. 25 of 1999, Section 38 (especially subsection 4). The recommendations contained in this document will be reviewed SAHRA in order to consider the significance of Site PGS06 prior to issuing a destruction permit.

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ANNEXURE A

BASIC STONE TOOL TERMINOLOGY

Archaeological context: sequence and definitions

Period	Approximate dates
Earlier Stone Age	more than 2 million years ago - 250 000/200 000 years ago
Middle Stone Age	200 000/250 000 years ago – 25 000 years ago to even around the Last Glacial Maximum (LGM) in some regions
Later Stone Age (Includes San Rock Art)	25 000 years ago - AD 200 and up to historic times in certain areas

Basic stone tool terminology

A core is a block of raw material from which flake-blades or bladelets have been removed. It is classified as a core only if there are at least three negative flake removal scars. Cores generally show much morphological variability and the size of raw materials influences the kind or reduction technology used (Andrefsky 2005).

A flake is a fragment of stone which has been removed from a core. Such a blank can be used to manufacture a variety of tools. The tiny flakes removed when shaping a flake blank are also called flakes (see retouch below). Flakes, but also bladelets and blades, are the main products of any reduction process.

Detached flakes are often classified as debitage or waste (Andrefsky 2005). However, flakes were undoubtedly used for a variety of tasks on wood, meat and bone as suggested by artefact function studies

and supported by ethnographic accounts.

Retouch is when small flakes or chips are removed from a blank flake in order to shape or transform a flake into a tool. Retouch shows in tiny regular negative scars on the tool.

Blank is a piece of stone (a flake) that has been removed from a core. It can potentially be modified through further shaping into a specific type of formal tool.

Other terms:

Acheulean. A second phase of the ESA associated with Large Cutting Tools such as handaxes and usually with early *Homo* species.

Anatomically Modern Humans (AMH). We use the term to describe fossils that clearly belong to the species *Homo sapiens sapiens*. Some physical anthropologists include all populations whose physique lies within the range of variation of living people and fossil forms of pre-modern humans, such as the Neandertals, in the singe subspecies *Homo sapiens sapiens*, whereas others prefer species names such as *Homo neanderthalensis* for archaic types. The term AMH has fewer biological implications and it is therefore generally used for fossils that clearly belong to the same species as us.

Artefacts. Traces of hominin behaviour in the form of tools.

Backing. A blade or flake that has been intentionally dulled on one margin (similar to a knife blade).

Biface. A tool with two surfaces (faces) that meet to form one cutting edge.

Bifacial trimming. Secondary shaping on both surfaces. A **uniface** exhibits trimming only on one surface, commonly the ventral surface.

Blade. A flake with parallel or sub-parallel sides that is at least twice as long as it is wide.

Cortex. A chemical or mechanical weathered surface on stone.

Debitage refers to waste from stone tool manufacture.

Distal. The tip of a flake or tool.

Dorsal. The side of a flake or detached piece with scars of previous flake removals or the side showing the original cortex/skin of the rock in the case of a primary (first in the sequence) flake.

Fauresmith. A transitional industry at the interface of the ESA and the MSA that dates to around 250

000/200 000 years ago. Prepared cores and small well-made handaxes are usually a feature of this phase.

Hominin. Members of the Homininiae, the subfamily to which humans belong.

Howiesons Poort. A MSA microlithic industry with tools made on fine-grained stone that date to around 60 000/65 000 years ago. At sites where a Howiesons Poort phase is present, it is often found interleaved between macrolithic MSA tools of earlier and later phases.

Knapper/knapping. A knapper is a skilled craftsman who produces stone flakes and formal tools through a reduction process, known as knapping.

Lithic means stone and is derived from Greek.

Oldowan. The earliest phases of the ESA. It is characterized by the use of chopper tools made on pebbles by early hominins.

Proximal. The section of a flake or a tool that contains the striking platform and the bulb of percussion/bulbar scar.

Stratigraphy. The ordered layering of units, e.g. the building up of a deposit over successive visits to a locality. The sequence of strata is used to relatively date the layers and the materials in layers to older and more recent occupations.

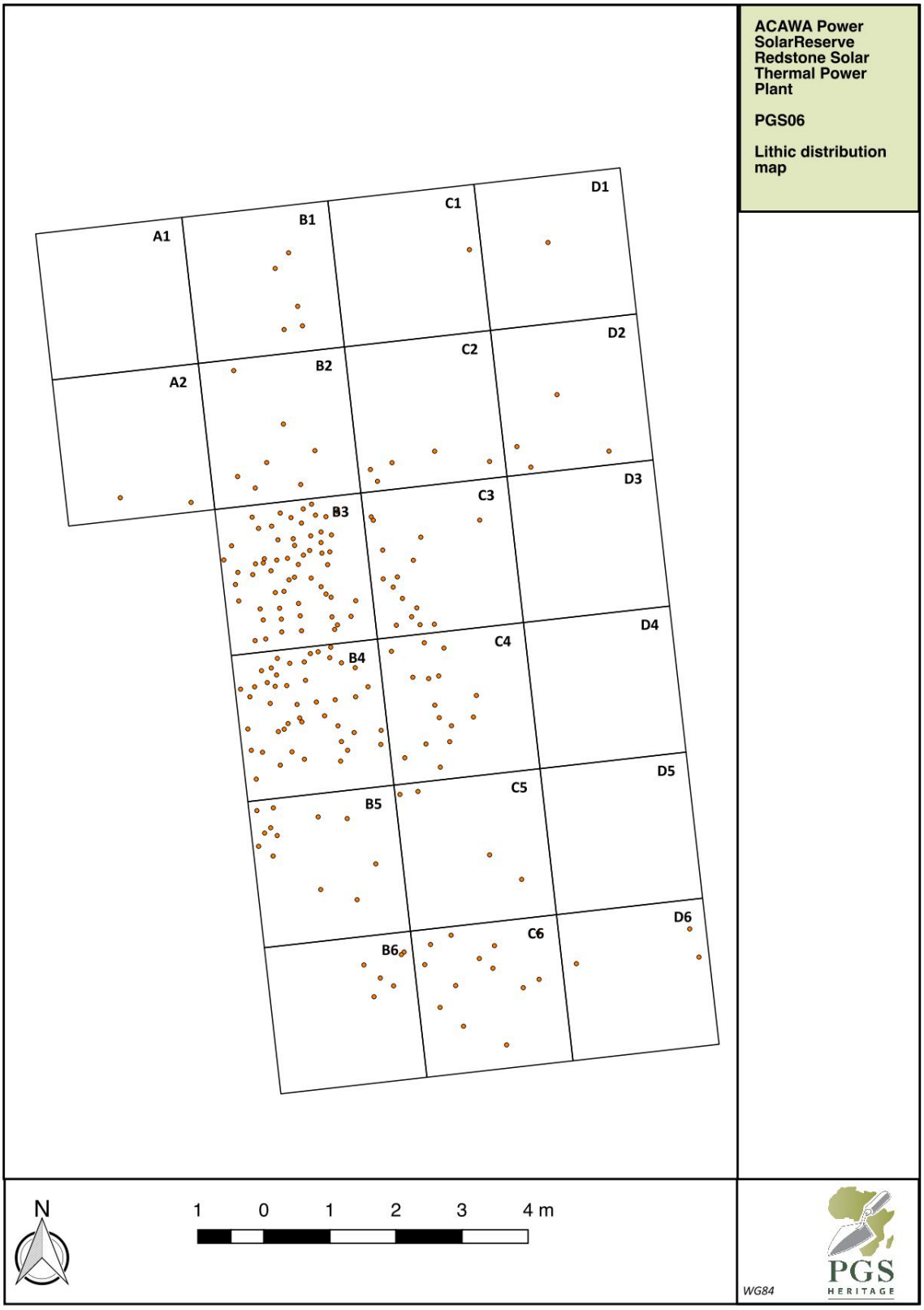
Striking platform. The area where a flake or blade was struck to remove it from the core.

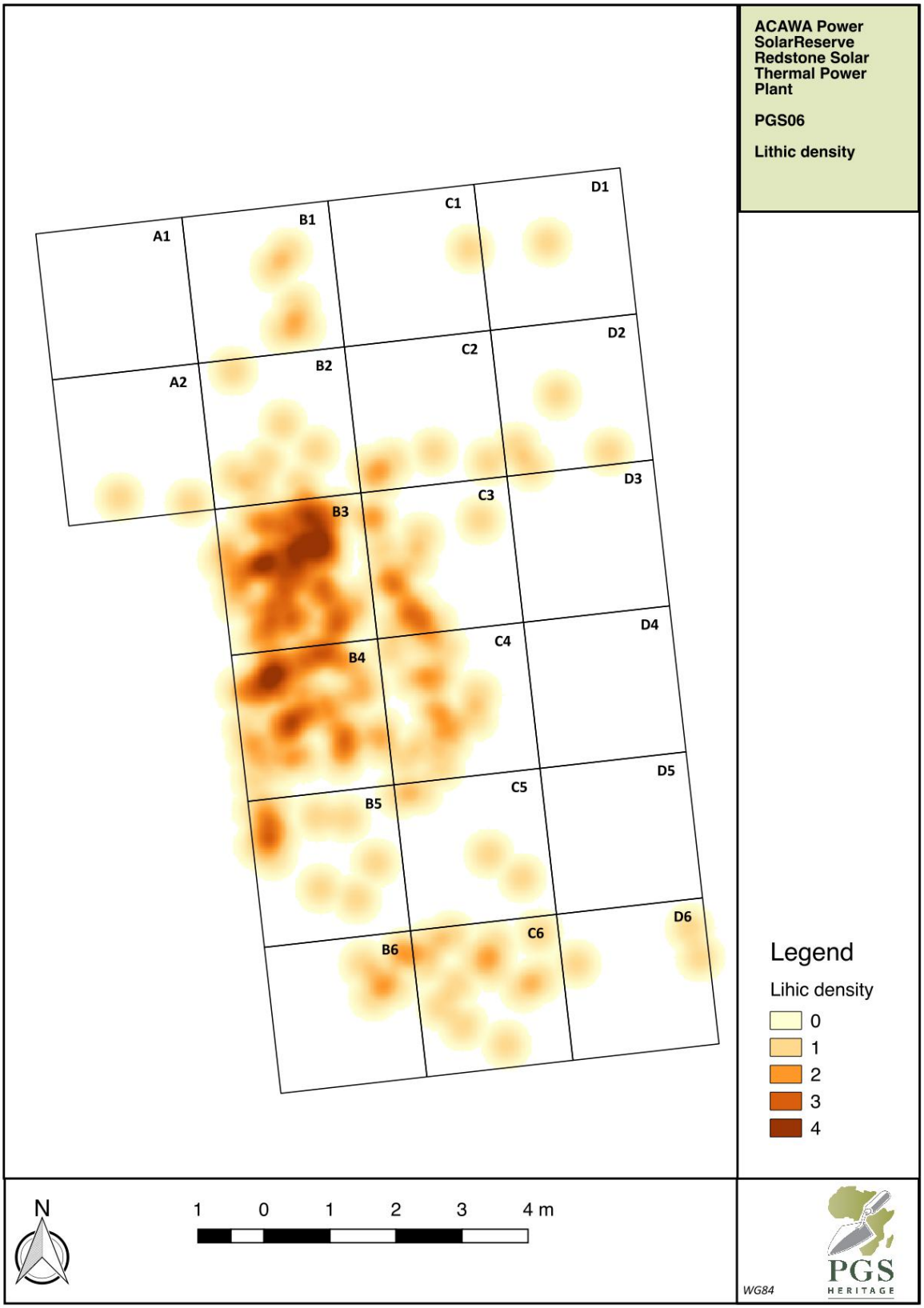
Typology. A systematic classification scheme used to order different types according to their characteristics in a relational system.

Ventral. The smooth surface of a detached piece with no evidence of previous flake removals. It usually contains a flake scar, the **bulb of percussion** that forms as a result of the force exerted to remove the flake from a core.

ANNEXURE B

SITE DISTRIBUTION MAP




ACAWA Power SolarReserve Redstone Solar Thermal Power Plant
PGS06
Lithic density
A1
B1
C1
D1
A2
B2
C2
D2
B3
C3
D3
B4
C4
D4
B5
C5
D5
B6
C6
D6
Legend
Lihic density
0
1
2
3
4
N
1 0 1 2 3 4 m
WG84
PGS HERITAGE

ANNEXURE C

SITE DOCUMENTATION PHOTOS

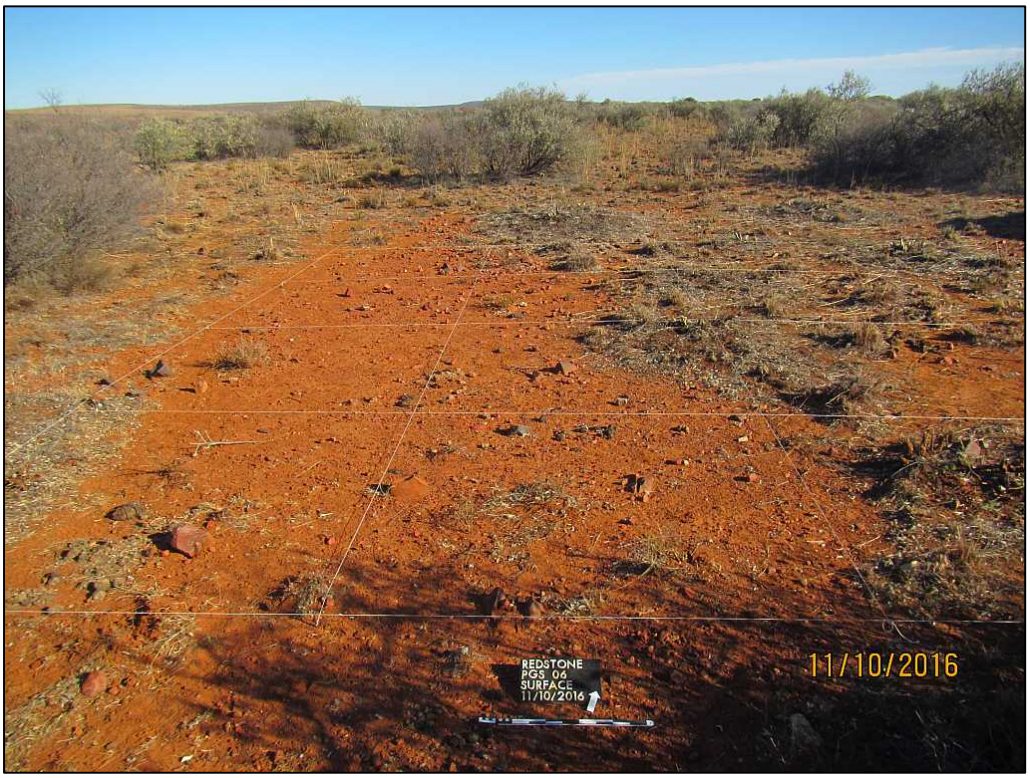


Figure 17: View of the site with grid in place

Figure 18: View of the site with all surface lithics tagged and ready to be recorded with the total station

Figure 19: Close up of B3 surface showing tagged lithics

Figure 20: Close up of B4 surface showing tagged lithics

Figure 21; Close up of C3 surface showing tagged lithics

Figure 22: Close up of C4 surface showing tagged lithics

Figure 23: View of B3 Q4 surface before excavation

Figure 24: View of B3 Q4 after excavation

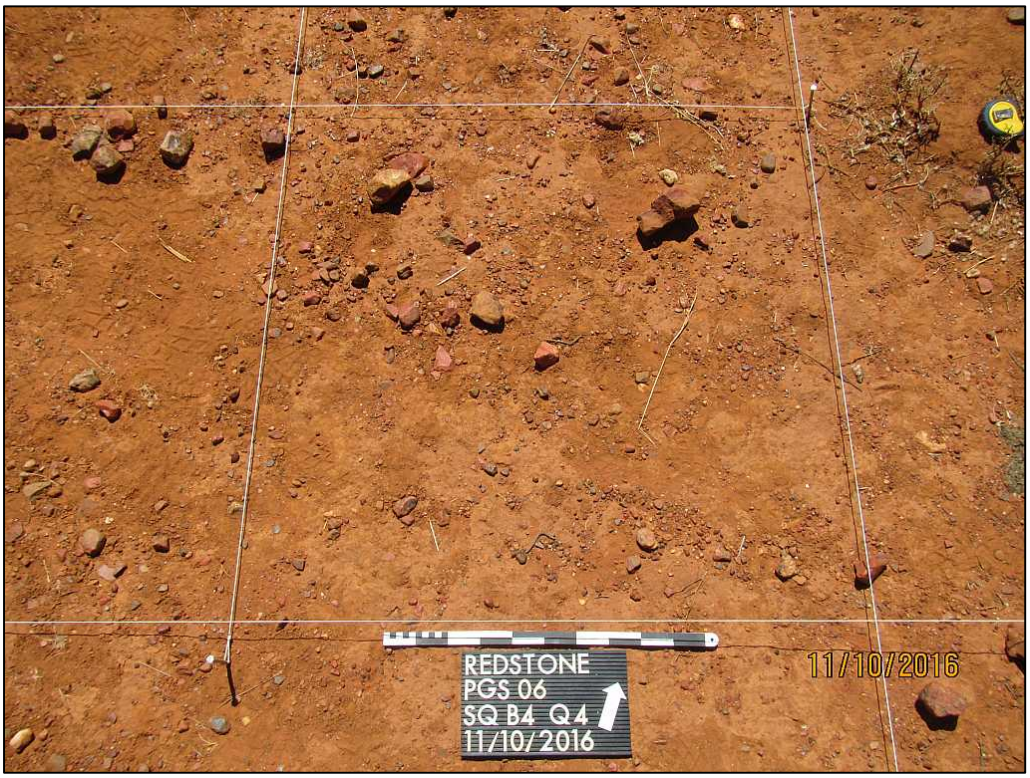


Figure 25: View of B4 Q4 before excavation

Figure 26: View of B4 Q4 after excavation

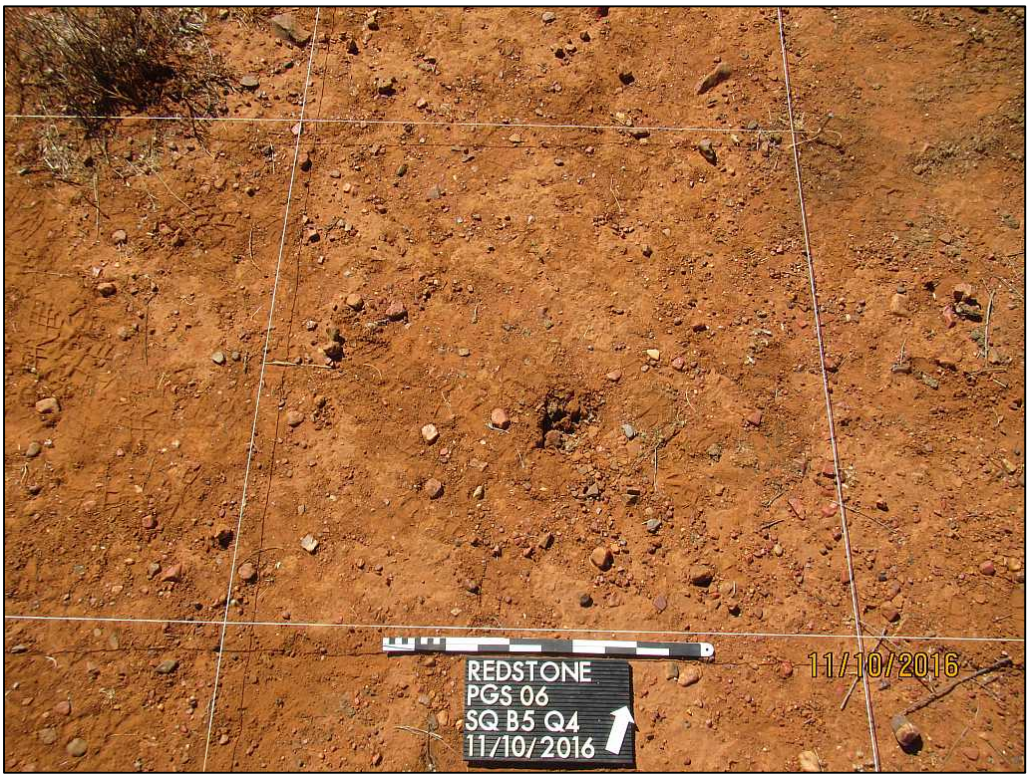


Figure 27: View of B5 Q4 before excavation

Figure 28: View of B5 Q4 after excavation

Figure 29: View of site after documentation was completed