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2015-09-23

ADDITIONAL ARCHAEOLOGICAL IMPACT STUDY FOR THE PROPOSED CAROCRAFT SOLAR PARK, NALEDI LOCAL MUNICIPALITY, BOPHIRIMA DISTRICT MUNICIPALITY, NORTH WEST PROVINCE

Executive Summary

Exigo Sustainability was commissioned by AGES Limpopo to conduct a heritage scan on portions of the farm Weltevrede 681IN, subject to an Environmental Impact Assessment (EIA) process for the proposed Carocraft Solar Park east of Vryburg in the Naledi Local Municipality, Bophirima District Municipality, North West Province. An initial Heritage Impact Assessment Study[1] conducted in 2012 investigated footprint areas for the Solar Park and relevant infrastructure. However, the Solar Park footprint area was changed to a surface are of 230ha, which included a new portion of approximately 80ha as well as an access road of approximately 1.9km connecting to the N14 which was not investigated during the initial HIA. As such, these components form the focus of this additional heritage assessment. This report includes background information on the area's archaeology, its representation in southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be added as Addendum to the initial HIA, which will be lodged with the South African Heritage Resources Agency (SAHRA) whereby recommendations contained in this document will be reviewed.

A number of archaeological and historical studies have been conducted in the Vryburg area and many of these studies infer a varied and rich heritage landscape. However, the landscape directly surrounding the property under study seems to have been sparsely populated by humans in the past, possibly as a result of the general scarcity of sustainable water sources as well as the absence of hills or outcrops for shelter. Stone Age and Historical Period occurrences were noted during the site survey:

- A medium density MSA scatter with single LSA tools (**Site Exigo-WE681-SA01)** was documented at a water pan in a northern section of the property. These Stone Age representations are of scientific interest due to the occurrence of

[1] Hutten, M . 2012. Heritage Impact Assessment for the Proposed Carocraft Solar Park east of Vryburg, North West Province.

formal diagnostic MSA lithics but no impact is foresee since the pan has already been excluded from site development. However, it is recommended that a 20m conservation buffer be initiated around the site and that the site should be monitored during construction and operational phases of the development by an informed ECO. Should this MSA scatter be directly impacted by development activities, the site must be recorded and the cultural and archaeological context of the heritage resource be established by means of a limited Phase 2 Specialist Study. This study should minimally include a surface sampling and consequent analysis of the stone artefacts by a qualified Stone Age specialist, in order to elucidate the understanding of the development and spread of the MSA in the area. The Specialist should obtain the necessary permits from SAHRA for the in-situ analysis, possible collection and photography of the artefacts during the study.

- A single Earlier Stone Age handaxe (**Site Exigo-WE681-SA02)** was located on the surface towards the north-eastern boundary of the study area. The tool occurs in isolation where no other diagnostic stone tools or debris seems to be present in its surroundings. As such, the occurrence is of low scientific value due to the general loss of context for the artefact and the absence of associated cultural material. It is nonetheless recommended that the site should be monitored during construction and operational phases of the development by an informed ECO.

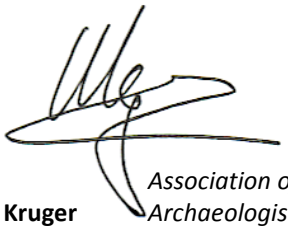
- A low density MSA scatter (specifically a broken point, a retouched side scraper and a flake tool) were noted along the proposed access road route connecting to the N14 (**Site Exigo-WE681-SA03)**. The access road alignment follows an existing farm road for the largest part and this area has been adversely altered and disturbed by traffic activity. The occurrence is of low heritage value due to the loss of artefact context and the low density of the diagnostic tools.

- An Historical Period farmstead structure consisting out of the poorly preserved remains of a stone farmhouse occurs directly west of the proposed access road route connecting to the N14 (**Site Exigo-WE681-HP01)**. The structure is historical significance but it occurs away from the access road alignment. It is nonetheless recommended that any activities pertaining to the construction of the road be monitored in order to avoid any possible impact on the site, and possibly on previously undetected heritage remains in the area. Should the structure be directly impacted by development activities, destruction permit from the relevant heritage resources authority (SAHRA) should be obtained.

Carocraft Solar Park Project heritage occurrences locations:

Waypoint Code	Description	Coordinate S	Coordinate E
Exigo-WE681-SA01	MSA / LSA scatter	S26.92871°	E24.89895°
Exigo-WE681-SA02	ESA Stone Tool	S26.92760°	E24.90067°
Exigo-WE681-SA03	MSA scatter	S26.917019°	E24.898145°
Exigo-WE681-HP01	Historical farmhouse ruin	S26.92275°	E24.90046°

Heritage resources have been documented in the additional Carocraft Solar Park and access road project footprint areas. From a culture resources management perspective, no lasting impact on heritage resources is foreseen, provided that the heritage component be closely monitored by the ECO during the construction process in order to avoid the destruction of existing, and previously undetected heritage remains. Should any previously undetected heritage remains be uncovered, the archaeologist should be alerted immediately. In the opinion of the author of this Archaeological Impact Assessment Report, the proposed Carocraft Solar Park and access road project may proceed subject to recommendations contained in this assessment, endorsed by the relevant Heritage Resources authorities.



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1. Background

Exigo Sustainability was commissioned by AGES Limpopo to conduct a heritage scan on portions of the farm Weltevrede 681IN, subject to an Environmental Impact Assessment (EIA) process for the proposed Carocraft Solar Park east of Vryburg in the Naledi Local Municipality, Bophirima District Municipality, North West Province. An initial Heritage Impact Assessment Study conducted in 2012 investigated footprint areas for the Solar Park and relevant infrastructure. However, the Solar Park footprint area was changed to include a new portion of approximately 80ha as well as an access road of approximately 1.9km connecting to the N14 which was not investigated during the initial HIA. As such, these components form the focus of this additional heritage assessment. The memo includes background information on the area's archaeology, its representation in southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

2. Project Description

A Photovoltaic (PV) Power Plant, known as the Carocraft Solar Park, access roads and power line is proposed on a part of Weltevrede 681IN east of Vryburg. The purpose of the Carocraft Solar Park is to add new capacity for the generation of renewable electrical energy to the national electricity supply. The use of solar radiation for power generation is considered as a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. With specific reference to photovoltaic energy and the proposed project, it is important to consider that South Africa has one of the highest levels of solar radiation in the world. The PV power plant will cover a footprint (fenced area) **up to 230ha**. This footprint includes development areas for the Solar Park as well as a **1900m** long access road link to the N14. The solar facility will have a maximum generating capacity **up to 75 MW.** The facility will comprise several arrays (strings) of PV modules mounted on frames; the associated infrastructure and structures will consist of:

- **internal and external access roads and a small parking area;**
- fencing of the plant and video security control systems;
- foundations / mini piles for the mounted Photovoltaic arrays;
- electricity access point for the construction phase, operation phase (if necessary) and UPS (Uninterruptible Power Supply) devices;
- water access point and/or water extraction on-site from borehole(s), water supply pipelines, water treatment;
- sewage system and storm water collection system;
- workshop & warehouse,
- offices & administrative area;
- cabling linking Photovoltaic strings and other internal cabling;
- medium voltage stations designed to host DC/AC inverters and medium voltage power transformers;
- one medium voltage receiving station, linking in parallel all the medium voltage stations; (xii) one small on-site high-voltage substation with high-voltage power transformer(s),
- stepping up the voltage to the voltage of the Eskom's grid, control building(s) and one busbar with metering and protection devices (also called "switching station").

The PV plant will mainly consist of the following components:

- **Photovoltaic cells and photovoltaic modules**: PV cells are made in silicone and act as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic module. The facility will use photovoltaic modules with high efficiency.
- **Support structures:** PV modules will be assembled on steel or aluminium frames. At this stage, the preferred technology for the mounting system is **the horizontal single-axis trackers**, depicted in Figure 1. Each tracker is composed by several PV arrays North-South oriented and linked by a horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, in order to follow the daily sun path.
- **Strings and string boxes:** the PV modules are connected in series in order to form PV strings, so that the string voltage fits into the voltage range of the DC/AC inverters. PV strings are devised in order to be connected to DC-connection boxes (string boxes) with a parallel connection solution (PV sub-field). String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a general circuit breaker in order to disconnect the photovoltaic sub-fields from the DC/AC inverters.
- **Medium voltage stations:** Each medium-voltage station is designed to host one or more DC/AC inverters, and one or more medium-voltage power transformers. The DC/AC inverters are deemed to convert the direct current (DC) to alternating current (AC) at low voltage; subsequently the AC will pass through a medium-voltage power transformer in order to step-up the voltage up to 20/22 kV.
- **Medium-voltage receiving station:** The energy from the medium voltage stations will be collected into one medium voltage receiving station, linking in parallel all the PV fields of the PV generator.
- **High-voltage loop-in loop-out substation:** from the medium-voltage receiving station, the electrical energy will be delivered to one small on-site high-voltage substation with two or more high-voltage power transformers (one as spare), stepping up the voltage to the voltage of the Eskom grid.
- **Interventions on the Eskom's network**: the connection may also entail interventions in the Eskom network.

Other key features of the project are to ensure a high level of reliability, operational and maintenance safety, low water consumption. The expected operational life of the plant is deemed of approximately 25-30 years.

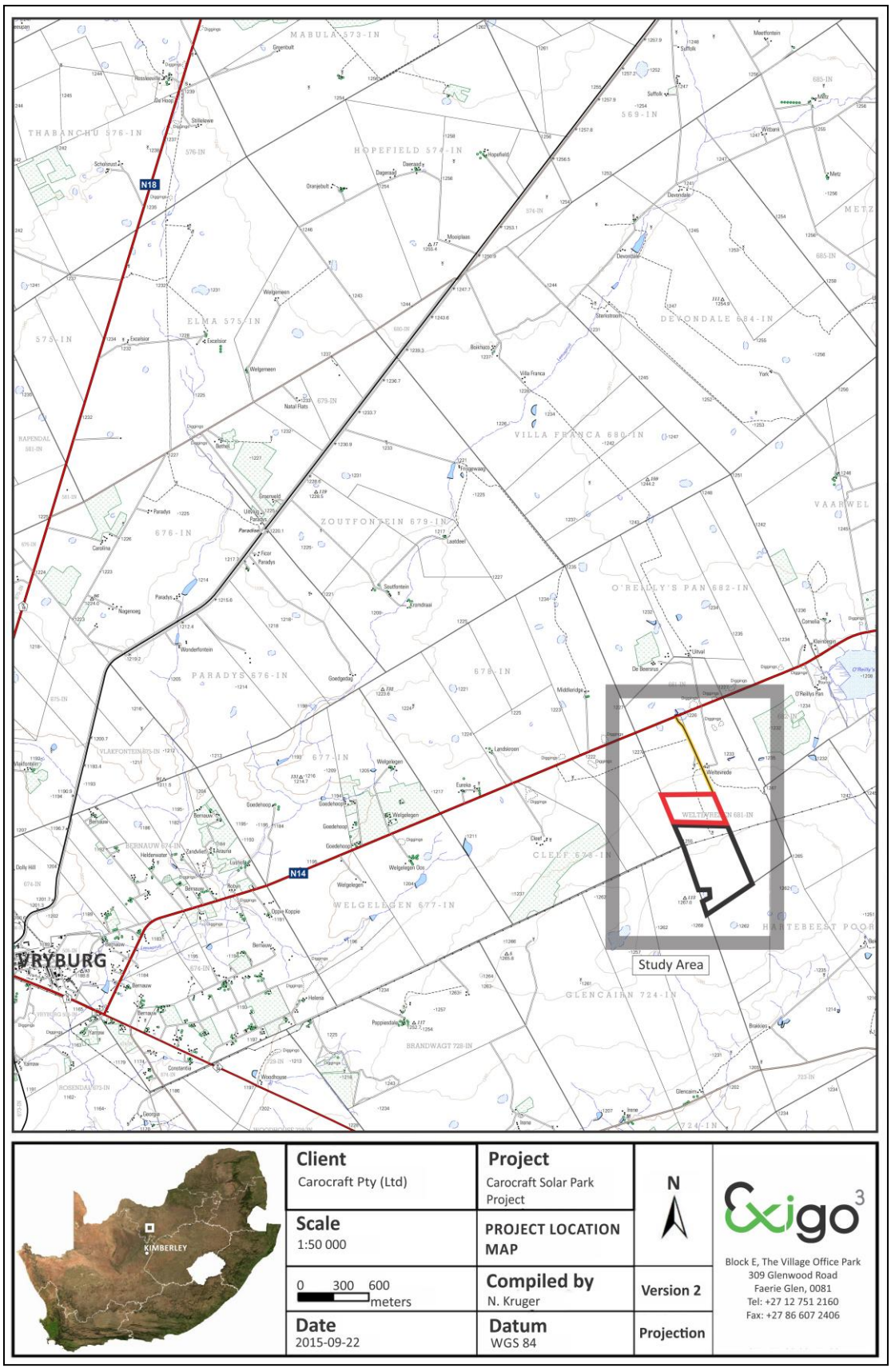

Figure 1: Geographical location of the Carocraft Solar Park project area (1:50 000 Map reference 2624DD). The initial footprint is indicated in black and the study area subject to this assessment is indicated in red and yellow (access road).

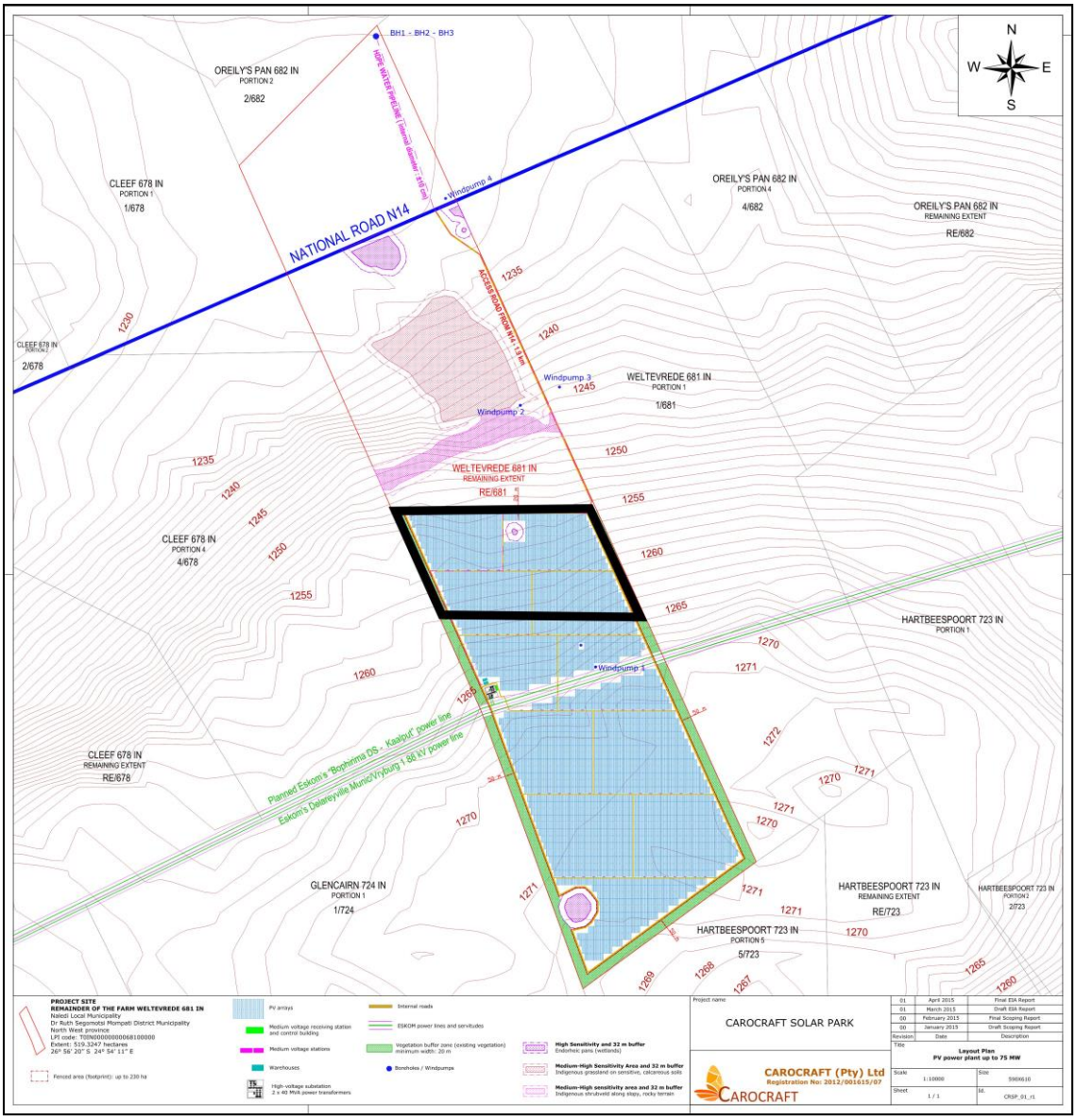

Figure 2: Plan of infrastructure proposed for the Carocraft Solar Park. The survey area subject to this heritage assessment is outlined in black.

- ***Current site status***

The proposed solar park will be constructed on surface areas of approximately 230ha. The property subject to the proposed project occurs on fairly flat terrain but the north-eastern portion of the study area is slightly contoured. Vegetation in the study area range from moderate to dense surface cover but large portions of the servitude of the existing Eskom "Delareyville Municipality – Vryburg 1" 88 kV power line, which bisects the project area have been altered and disturbed as a result of the existing power line. The current land-use on the property is mainly grazing by livestock and game. Neighbouring farms are being used for livestock grazing and game farming. The major land use of the study area as classified by the Environmental Potential Atlas of South Africa (2000) is vacant / unspecified land.

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Figure 3: View of the Carocraft Solar Park project area along the western periphery of the study area.

Figure 4: View of the Carocraft Solar Park project area along the southern periphery of the study area.

Figure 5: View of the Carocraft Solar Park project aree, note deep red sands.

Figure 6: View of the surroundings at the proposed access road for the Carocraft Solar Park project area along the eastern periphery of the study area.

Figure 7: View of a windmill and existing farm road along at the proposed access road for the Carocraft Solar Park project area.

Figure 8: Access gate to the proposed access road for the Carocraft Solar Park project area.

3. Heritage survey and scoping

A number of archaeological and historical studies have been conducted in the Vryburg area and many of these studies infer a varied and rich heritage landscape. However, the landscape directly surrounding the property under study seems to have been sparsely populated by humans in the past, possibly as a result of the general scarcity of sustainable water sources as well as the absence of hills or outcrops for shelter. An archaeological scoping survey at the Carocraft Solar Park and access road site (2015-09-16) was done by means of a pedestrian survey in accordance with standard archaeological practise by which heritage resources are observed and documented. The visibility at the time of the survey was moderate as surface cover on the property, although semi-arid, is relatively protein. By means of a transect survey, the landscape and the site impacted on was investigate, heritage features were recorded using a Garmin E-trex Legend GPS (see Figure 9) and photographs were taken with a Canon Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible sensitive areas during the survey (see Figure 10). As most archaeological material occur in single or multiple stratified layers beneath the soil surface, special attention was given to disturbances, both man-made such as roads and clearings, as well as those made by natural agents such as burrowing animals and erosion.

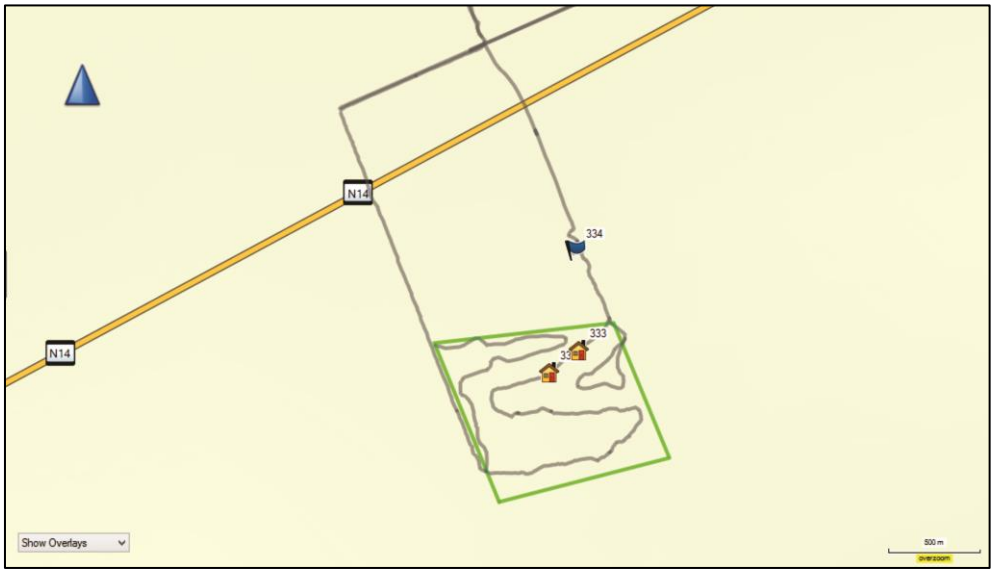

Figure 9: Garmin GPS Track log for the site survey, indicated in grey. The survey area for the Solar Park is indicated in green.

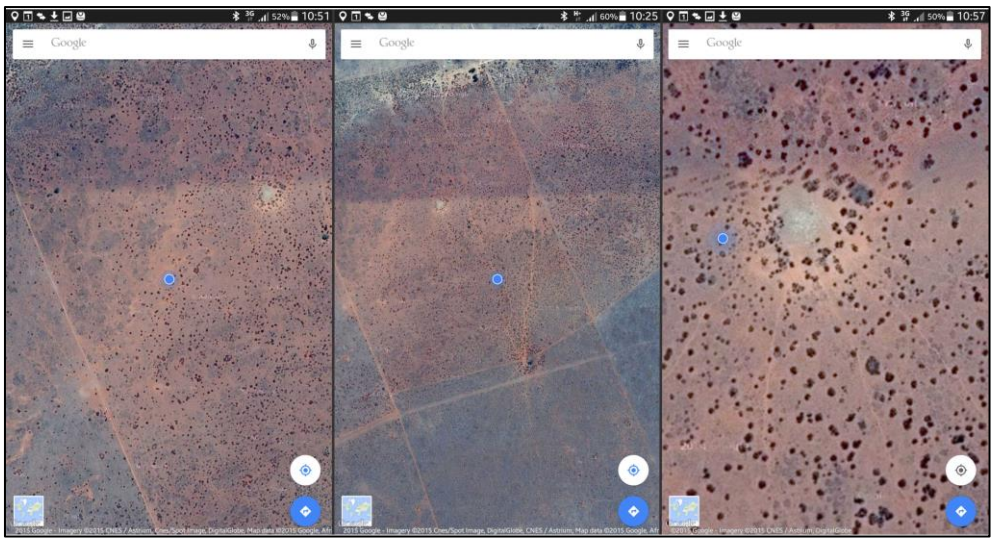

Figure 10: Screen cations of the real time aerial imagery survey.

Earlier, Middle Stone Age and Later Stone Age occurrences, as well as Historical Period structures were noted during the site survey. These heritage occurrences were arbitrarily coded according to the name of farms on which sites were located, e.g. **Exigo-WE681-SAxx** (Exigo Weltevrede 681 Stone Age Site) and **Exigo-WE681-HPxx** (Exigo Weltevrede 681 Historical Period Site).

- **Site Exigo-WE681-SA01 (S26.92871° E24.89895°)**

A medium density MSA scatter with single LSA tools was documented at a water pan in a northern section of the property. Although there may be some mixing of an earlier MSA assemblage with a few lithics from the more recent LSA utilization, the surface collection shows a predominant MSA signature. Preliminary examinations of some of the lithics, which includes chunks and utilised flake, and formal tools such as scrapers, blades and points indicate that a number of flakes display facetted platforms, characteristic of the MSA. Here, prepared cores show evidence of the use of the Levallois technique, where surfaces on the core are shaped in order to generate a specific formal tool when flaked from the core. Use wear and marks are clearly visible on formal tools. The raw material used in the production of the lithics is mostly hornfels, shale and banded ironstone. Banded ironstone is known to have been a favoured raw material for making stone artefacts and occurs on a number of sites that have been documented by the archaeologist and others throughout the Northern Cape. It occurs fairly widely over the site and was clearly a desirable raw material which was targeted by LSA people for its superior flaking qualities. It is not possible to assign an age estimate without an in-depth analysis of a more representative sample. At this stage it would be prudent to say that these open-air collections probably represent a palimpsest of visits by prehistoric groups up to the MSA. No evidence of any factory or workshop site, or the result of any human settlement was identified. These Stone Age representations are of scientific interest due to the occurrence of formal diagnostic MSA lithics but no impact is foresee since the pan has already been excluded from site development. However, it is recommended that a 20m conservation buffer be initiated around the site and that the site should be monitored during construction and operational phases of the development by an informed ECO. Should the Stone Age occurrence be directly impacted by development activities, the site must be recorded and the cultural and archaeological context of the heritage resource be established by means of a limited Phase 2 Specialist Study. This study should minimally include a surface sampling and consequent analysis of the stone artefacts by a qualified Stone Age specialist, in order to elucidate the understanding of the development and spread of the MSA in the area. The

Specialist should obtain the necessary permits from SAHRA for the in-situ analysis, possible collection and photography of the artefacts during the study.

Figure 11: A small water pan at Site Exigo-WE681-SA01.

Figure 12: MSA lithics from Site Exigo-WE681-SA01: broken points (left) and scrapers (right).

Figure 13: Weathered points (left, center) and a broken blade (right) from Site Exigo-WE681-SA01.

Figure 14: Weathered and broken blades Site Exigo-WE681-SA01.

Figure 15: Secondary retouch visible on side and end scrapers from Site Exigo-WE681-SA01.

Figure 16: An LSA core (left) and an LSA end scraper (right) from Site Exigo-WE681-SA01.

- **Site Exigo-WE681-SA02 (S26.92760° E24.90067°**

A single broken Earlier Stone Age handaxe (was located on the surface towards the north-eastern boundary of the study area. The tool occurs in isolation where no other diagnostic stone tools or debris seems to be present in its surroundings. As such, the occurrence is of low scientific value due to the general loss of context for the artefact and the absence of associated cultural material. It is nonetheless recommended that the site should be monitored during construction and operational phases of the development by an informed ECO.

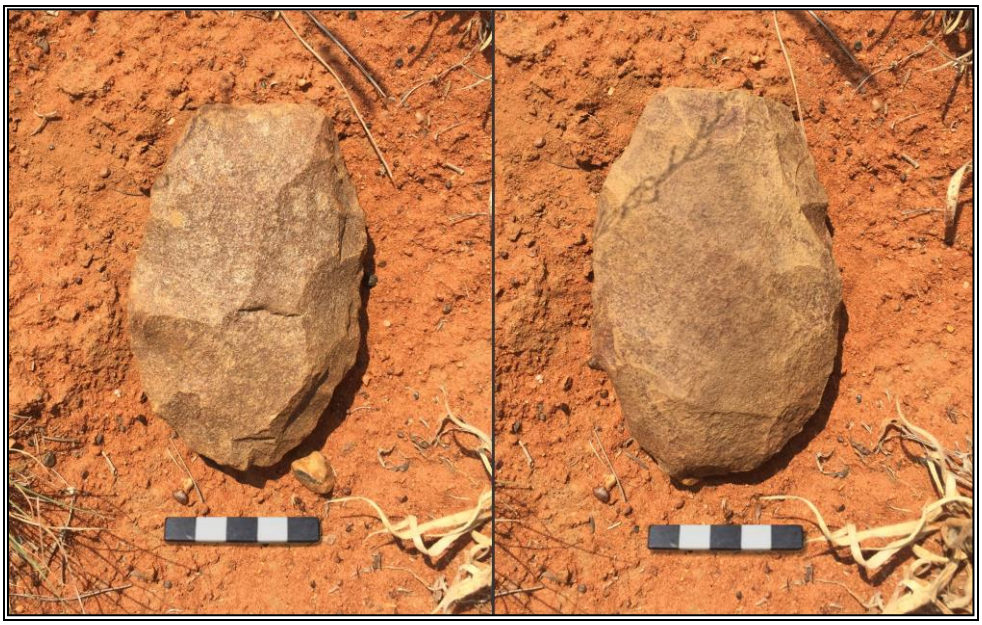

Figure 17: Posterior and anterior views of a broken ESA handaxe from Site Exigo-WE681-SA02.

- **Site Exigo-WE681-SA03 (S26.917019° E24.898145°)**

A low density MSA scatter (specifically broken points, retouched side scraper and flake tools) were noted within a decomposing calcrete horizon along the proposed access road route connecting to the N14. The access road alignment follows an existing farm road for the largest part and this area has been adversely altered and disturbed by traffic activity. The occurrence is of low heritage value due to the loss of artefact context and the low density of the diagnostic tools.

Figure 18: View of a decomposing calcrete horizon along the proposed access road at Site Exigo-WE681-SA03.

Figure 19: Flakes (left) and broken points (right) from Site Exigo-WE681-SA03.

- **Site Exigo-WE681-HP01 (S26.92275° E24.90046°)**

An Historical Period farmstead structure consisting out of the poorly preserved remains of a stone farmhouse occurs directly west of the proposed access road route connecting to the N14. The structure is historical significance but it occurs away from the access road alignment. It is nonetheless recommended that any activities pertaining to the construction of the road be monitored in order to avoid any possible impact on the site, and possibly on previously undetected heritage remains in the area. Should the structure be directly impacted by development activities, destruction permit from the relevant heritage resources authority (SAHRA) should be obtained.

Figure 20: View of a stone ruin at a farmstead at Site Exigo-WE681-HP01.

4. Archaeo-historical context

The history of the Nortwest Province is reflected in a rich archaeological landscape, mostly dominated by Stone Age occurrences. Numerous sites, documenting Earlier, Middle and Later Stone Age habitation occur across the landscape, mostly in open air locales or in sediments alongside rivers or pans. In addition, a wealth of Later Stone Age rock art sites, most of which are in the form of rock engravings are to be found in the larger landscape. These sites occur on hilltops, slopes, rock outcrops and occasionally in river beds.. Most of our knowledge of the archaeology of the region is largely dependent on the work undertaken by Humphreys & Thackeray (1983) to the south of Kuruman, and on the Ghaap escarpment, as well as that of Beaumont (1990). Sites dating to the Iron Age occur in the north eastern part of the Northwest Province but environmental factors delegated that the spread of Iron Age farming westwards from the 17th century was constrained mainly to the area east of the Langeberg Mountains. However, evidence of an Iron Age presence as far as the Upington area in the eighteenth century occurs in this area. Moving into recent times, the archaeological record reflects the development of a rich colonial frontier, characterised by, amongst others, a complex industrial archaeological landscape such as mining developments at Kimberley, which herald the modern era in South African history. Finally, the Northwest Province saw a number of war conflicts, particularly the Anglo Boer War (or the South African War) left behind the remnants of battlefields, skirmishes and concentration camps

Early History: Stone Ages

The Taung area is significant in terms of early human development. In 1924, the fossilized skull of an early human infant was discovered by a quarry-worker in the nearby Buxton-limestone quarry. The fossil remains were described by Raymond Dart in 1925 as the type specimen of Australopithecus africanus. Later *in-situ* excavations were conducted under the direction of Phillip Tobias of the University of the Witwatersrand, and although they failed to find additional hominid specimens they did recover

many important fossil baboons. The Taung Child, as the hominin fossil became known, is among the most important early human fossils ever discovered. It was the first hominid to be discovered in Africa, a species later named *Australopithecus africanus.* Stone Age sites are not randomly scattered within the landscape and they occur either near water sources or close to local sources of two highly-prized raw materials, specularite and jaspilite. As such, tools dating to all phases of the Stone Age are mostly found in the vicinity of larger watercourses, e.g. the Vaal River or the Harts River and near pans. More recent surveys have documented Acheullian industries and continuity between ESA and MSA lithic technologies in the same area. Excavations at other well-known sites in the wider region attest to further ESA and MSA occupation, some of which have yielded have yielded significant Stone Age assemblages that all inform on our general understanding of the technological sequences of the Stone Age in the Northern Cape and the Northwest (e.g. see Beaumont 2008, 2009; Morris 2006; Morris 2007; Dreyer 2007).

Further afield it is worth noting that a significant Stone Age site occurs in and around the town of Kathu, approximately 120km west of the study area. This site, known as Kathu Pan, is a shallow water pan about 30ha in extent. The site was extensively studied from 1974 to 1990 by Humpreys and Beaumont, amongst others. Kathu Pan is an extremely significant site as it represents the major industries of the Stone Age, more specifically two phases of the Earlier Stone Age, two phases of the Middle Stone Age, and more or less the entire Later Stone Age (Beaumont 1990). The site yielded large amounts of hand axes and faunal remains, including the concentrated remains of large mammal remains. More recently, research by Jayne Wilkins revealed a hoard of stone points, each between 4 and 9 centimeters long, that they think belonged to the earliest stone-tipped spears yet found. The stone points are the right shape and size for the job, and some have fractured tips that suggest they were used as weapons. Since stone points used on spears had been found only at sites that date back no more than 300 000 years, these discoveries in the 500 000-year-old deposits at Kathu is greatly significant. The abundance of Stone Age material at Kathu Pan can probably be attributed to the presence of a permanent water source at the pan.

The landscape around the town of Kuruman is rich in archaeological material dating to Earlier and Middle Stone Ages. Sites such as Wonderwerk Cave, Kathu Pan and Kathu Townlands (see below) have yielded significant Stone Age assemblages that all inform on our general understanding of the technological sequences of the Stone Age in the Northern Cape (e.g. see Beaumont 2008; Morris 2006; Morris 2007; Dreyer 2007). In addition, a large amount of Middle and Later Stone Age sites have been documented across the landscape on calcrete lined pans and road cuttings.

Rock Markings

Rock engravings are mostly situated in the semi-arid plateau with most of these engravings situated at the Orange – Vaal basin, Karoo and Namibia. The upper Vaal, Limpopo basin and eastern Free State regions have a small quantity of rock engravings as well. Generally, rock paintings exist at cave areas and rock engravings at open surface areas. The Cape interior consists of a technical, formal and thematic variation between and within sites (Morris 1988). Two major techniques existed namely the incised and pecked engravings. Morris (1988) indicated technical and formal characteristics through space and a sharp contrast exists between engravings positioned north of the Orange River that are mostly pecked and those in the Karoo where scraping was mostly used. According to Morris (1988) hairline engravings occur at the North and the South, but they are rare at the Vryburg region. Finger painting techniques mostly occur at the Kuruman Hills, Asbestos Mountains, Ghaap Escarpment, Langeberg, Koranaberg ranges, scattered sites at the Karoo and the Kareeberge (Morris 1988). The development petroglyphs

(i.e. carving or line drawing on rock) were associated with three different types of techniques, namely incised fine lines, pecked engravings and scraped engravings. According to Peter Beaumont the pecked and scraped engravings at the Upper Karoo are coeval (i.e. having the same age or date of origin) (Beaumont P B et al. 1989). Dating of rock art includes the use of carbonate fraction dating of ostrich eggshell pieces, dating of charcoal and ostrich eggshell at various rock art shelters. Unifacial points, double segments and thin – walled sherds may indicate the presence of the Khoikhoi at the Northern Cape during 2500 BP (years Before the Present) (Beaumont 1989). The LSA is further represented in the wider area by hunter-gatherer site at Thaba Sione to the west of Lichtenburg. The site has a lithic tool industry and 451 boulders engraved with imagery of animals, human figures and geometric shapes and is still used today as an ancestral site by the Zion Christian Church (Ouzman 1995). Another engraving site can be found at Bosworth, a Provincial Heritage Site, near Klerksdorp. The more immediate region was historically occupied by Korana people who left evidence of their presence in the form of rock paintings, the greatest density being in the Harts River valley to the south of the study area (Ouzman 2005) where famous paintings occur just to the north of Schweizer-Reneke

Early History: Iron Age

The beginnings of the Iron Age (Farmer Period) in southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Stone ruins indicate the occurrence of Iron Age settlements in the Northern Cape specifically at sites such as Dithakong where evidence exists that the Thlaping used to be settled in the Kuruman – Dithakong areas prior to 1800 (Humphreys 1976). Here, the assessment of the contact between the Stone Age, Iron Age and Colonial societies are significant in order to understand situations of contact and assimilation between societies. As an example, Trade occurred between local Thlaping Tswana people and the Khoikhoi communities. It means that the Tswana traded as far south as the Orange River at least the same time as the Europeans at the Cape (Humphreys 1976).

Later History: Colonial Times

As noted elsewhere, the landscape around the study area was scarcely populated in Historical times and it was only towards the early 19th century that missionaries, hunters and traders access the region. These pioneers were followed by Colonial farmers who negotiated with local chiefs for land, or occupied areas that were perceived to be vacant. In some areas short-lived Boer Republics were established. With the influx of farmers came the establishment of a number of small towns, some of which include Vryburg, Reivilo and Hartswater. The town of Vryburg was founded on September 20, 1882, when a site for a township was selected and named Endvogelfontein. The name “Vryburg” comes from the period in the 1882 when Vryburg was established as the capital of Republic of Stelleland, where the Republicans called themselves “Vryburgers” ("free citizens"). On November 15 the same year, the name was changed to Vryburg. In December that year, newly laid out plots were apportioned to the volunteers by means of a lottery and by February 1883 some 400 farms had been established. The farm Kankatjes was surveyed in 1890 as part of the larger farmland around Vryburg. During the Second Boer War, the British built a concentration camp here to house Boer women and children. The small town of Reivilo was laid out in 1917 and named Klein Boetsap. This was

changed to Reivilo in 1927, which was an inversion of the name of the local minister, Rev. A J Olivier. The original church in town is a provincial heritage site. The town of Hartswater was laid out in 1948 to supply infrastructure for the construction and maintenance of the building and developing the Vaalharts irrigation scheme.

The Northern Cape was subjected to a resettlement program during the apartheid years. Tswana families were divided into the men who had to live in a compound and the women who were sent to a relocation centre (Hallett 1984). Between 1960 and 1962 it was estimated that an average of 834,000 people were affected by the Group Areas Act (Hallett 1984).

The majority of farms in the study area were proclaimed in the last decade of the 19th century.

5. Results: Statement of significance and Impact Rating

5.1 Direct Impact Rating

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts. **Direct or primary effects** on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. **Indirect effects or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access.

The following tables summarize impacts to archaeological material anticipated for the Carcraft Solar Park and access road Project:

Exigo-WE681-SA01

NATURE OF IMPACT: Impacts could involve displacement or destruction of Stone Age material in the Carocraft Project area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Minor	Minor
PROBABILITY	Improbable	Very improbable
SIGNIFICANCE	High	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible

IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Avoidance, conservation buffer, site monitoring by Heritage Specialist & ECO.		
CUMULATIVE IMPACTS: No cumulative impact is anticipated.		
RESIDUAL IMPACTS: n/a		

Exigo-WE681-SA02, Exigo-WE681-SA03

NATURE OF IMPACT: Impacts could involve displacement or destruction of Stone Age material in the Carocraft Project area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Minor	Minor
PROBABILITY	Definite	Very improbable
SIGNIFICANCE	Low	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Site monitoring by Heritage Specialist & ECO.		
CUMULATIVE IMPACTS: No cumulative impact is anticipated.		
RESIDUAL IMPACTS: n/a		

Exigo-WE681-HP01

NATURE OF IMPACT: Impacts could involve displacement or destruction of Historical Period structures in the Carocraft Project area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Minor	Minor
PROBABILITY	Very improbable	Very improbable
SIGNIFICANCE	Medium	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Avoidance, conservation buffer, site monitoring by ECO.		
CUMULATIVE IMPACTS: No cumulative impact is anticipated.		
RESIDUAL IMPACTS: n/a		

5.2 Management Actions

Recommendations for relevant heritage resources management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of the Addendum. The following management measures would be required during implementation of the proposed Carocraft Solar Park Project.

OBJECTIVE: prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

For the high significance MSA & LSA Stone Age occurrences (*Exigo-WE681-SA01*) the following are required in terms of heritage management and mitigation:

PROJECT COMPONENT/S	All phases of construction.		
POTENTIAL IMPACT	Damage/disturbance of previously undetected heritage remains.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface, have not been detected prior to development.		
MITIGATION: TARGET/OBJECTIVE	To adequately document the historic fabric of previously undetected heritage remains as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)			
Site Monitoring: Site inspection by a Stone Age archaeologist familiar with the archaeological sequence of the area in order to monitor possible impacts one Stone Age receptors.		Stone Age archaeologist	At least once during construction phases of the proposed development.
Site Monitoring: Site inspection by an informed ECO in order to monitor possible impacts one Stone Age receptors.		ECO	Monitor as frequently as practically possible.
Avoidance: Implement a heritage conservation buffer of at least 20m around the heritage resource.		DEVELOPER	Construction and operational phases.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

For other Stone Age occurrences of low significance (*Exigo-WE681-SA02, Exigo-WE681-SA03*) the following are required in terms of heritage management and mitigation:

PROJECT COMPONENT/S	All phases of construction.
POTENTIAL IMPACT	Damage/disturbance of previously undetected heritage remains.
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface, have not been detected prior to development.

MITIGATION: TARGET/OBJECTIVE	To adequately document the historic fabric of previously undetected heritage remains as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)			
Site Monitoring: Site inspection by an informed ECO in order to monitor possible impacts one Stone Age receptors.		ECO	Monitor as frequently as practically possible.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

For the medium significance Historical Period Structure (Exigo-WE681-HP01) the following are required in terms of heritage management and mitigation:

PROJECT COMPONENT/S	All phases of construction.		
POTENTIAL IMPACT	Damage/disturbance of previously undetected heritage remains.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface, have not been detected prior to development.		
MITIGATION: TARGET/OBJECTIVE	To adequately document the historic fabric of previously undetected heritage remains as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)			
Site Monitoring: Site inspection by an informed ECO in order to monitor possible impacts on Historical Period Structures.		ECO	Monitor as frequently as practically possible.
Avoidance: Implement a heritage conservation buffer of at least 20m around the heritage resource.		DEVELOPER	Construction and operational phases.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

6. Recommendations

A number of archaeological and historical studies have been conducted in the Vryburg area and many of these studies infer a varied and rich heritage landscape. However, the landscape directly surrounding the property under study seems to have been sparsely populated by humans in the past, possibly as a result of the general scarcity of sustainable water sources as well as the absence of hills or outcrops for shelter. The following recommendations are made based on general observations in the proposed Carocraft Solar Park and access road Project Area:

- A medium density MSA scatter with single LSA tools (**Site Exigo-WE681-SA01) was documented** at a water pan in a northern section of the property. These Stone Age representations are of scientific interest due to the occurrence of formal diagnostic MSA lithics but no impact is foresee since the pan has already been excluded from site development. However, it is recommended that a 20m conservation buffer be initiated around the site and that the site should be monitored during construction and operational phases of the development by an informed ECO. Should this MSA scatter be directly impacted by development activities, the site must be recorded and the cultural and archaeological context of the heritage resource be established by means of a limited Phase 2 Specialist Study. This study should minimally include a surface sampling and consequent analysis of the stone artefacts by a qualified Stone Age specialist, in order to elucidate the understanding of the development and spread of the MSA in the area. The Specialist should obtain the necessary permits from SAHRA for the in-situ analysis, possible collection and photography of the artefacts during the study.

- A single Earlier Stone Age handaxe (**Site Exigo-WE681-SA02)** was located on the surface towards the north-eastern boundary of the study area. The tool occurs in isolation where no other diagnostic stone tools or debris seems to be present in its surroundings. As such, the occurrence is of low scientific value due to the general loss of context for the artefact and the absence of associated cultural material. It is nonetheless recommended that the site should be monitored during construction and operational phases of the development by an informed ECO.

- A low density MSA scatter (specifically a broken point, a retouched side scraper and a flake tool) were noted along the proposed access road route connecting to the N14 (**Site Exigo-WE681-SA03)**. The access road alignment follows an existing farm road for the largest part and this area has been adversely altered and disturbed by traffic activity. The occurrence is of low heritage value due to the loss of artefact context and the low density of the diagnostic tools.

- An Historical Period farmstead structure consisting out of the poorly preserved remains of a stone farmhouse occurs directly west of the proposed access road route connecting to the N14 (**Site Exigo-WE681-HP01)**. The structure is historical significance but it occurs away from the access road alignment. It is nonetheless recommended that any activities pertaining to the construction of the road be monitored in order to avoid any possible impact on the site, and possibly on previously undetected heritage remains in the area. Should the structure be directly impacted by development activities, destruction permit from the relevant heritage resources authority (SAHRA) should be obtained.

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GENERAL LEGISLATIVE FRAMEWORK

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

"38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50 m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIA's) or scoping to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects.

- It must also be clear that Archaeological Specialist Reports (AIA's), Heritage Impact Assessment Reports (HIA's) and included motivations and recommendations will be assessed by the relevant heritage resources authority (SAHRA). The final decision as to heritage resources conservation, mitigation and destruction rests with the heritage resources authority. The close vicinity of the existing Fort Jackson cemetery should be regarded and impact on existing graves / burial places should be avoided at all times.