



Aboriginal Archaeological and Ethnographic Site Identification Survey

Cardno on behalf of Department of Housing (WA)

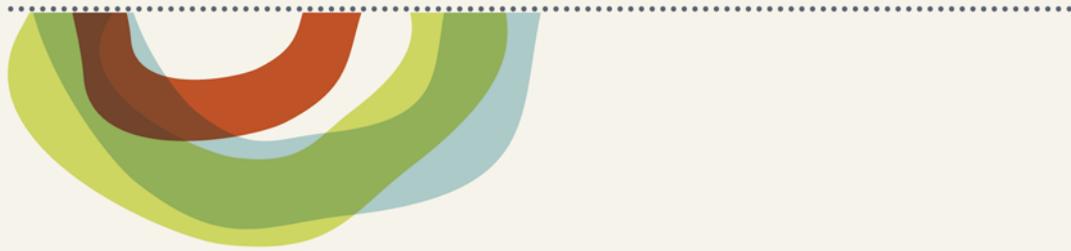
Lots 9001, 570-572 and 574, Murdoch Drive, South
Hedland, WA

Final Report

January 2015

AHMS

ARCHAEOLOGICAL & HERITAGE
MANAGEMENT SOLUTIONS



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Pty Ltd on behalf of Cardno and Department of Housing (WA)**

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PROJECT NAME	Cardno DOH Port Hedland
REAL PROPERTY DESCRIPTION	Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland
DATE	January 2015

AHMS INTERNAL REVIEW/SIGN OFF				
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EXECUTIVE SUMMARY

In March 2014, Cardno, on behalf of the Department of Housing (WA) engaged Archaeological and Heritage Management Solutions Pty Ltd (AHMS) to undertake archaeological and ethnographic Site Identification surveys for a proposed housing development 20 km south of Port Hedland at Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland, Pilbara, Western Australia. Representatives of the Kariyarra Native Title Claim (WC 99/003), as nominated by Marapikurrinya Pty Ltd participated in field survey.

The survey was commissioned to identify Aboriginal sites, objects or Aboriginal cultural heritage values within the subject area and determine whether or not the proposed development would impact upon these values and, in consultation with the Kariyarra Native Title Claimants, to determine appropriate heritage management recommendations.

A search of the Department of Aboriginal Affairs (WA) Aboriginal Heritage Inquiry System revealed no previously registered Aboriginal sites or heritage reports associated with the area.

The surveys were undertaken on Thursday 20 March 2014 by John Tunn (AHMS), Bryn Coldrick (Amergin Consulting) and with the cooperation and participation of Leslie Ware, Charlie Counsellor, Thomas Monaghan and Kieran Geary (Kariyarra Native Title claimants). The entire survey area was systematically assessed by a five person team using pedestrian transects. Ground surface visibility varied from 0-100%, with an estimated average visibility of approximately 20%, and is classified as poor. The ground surface was variously obscured by vegetation, dumped rubbish and/or the effects of recent construction activity. These factors greatly reduced assessment visibility and the ability to detect archaeological materials. Nevertheless, AHMS are confident that the coverage achieved was sufficient and appropriate for the purpose of identifying archaeological sites that meet the criteria under section 5 of the *Aboriginal Heritage Act 1972* (WA).

No archaeological features or sites, as defined by section 5 of the *Aboriginal Heritage Act 1972* (WA), were located during this survey.

No ethnographic sites were reported within the study area by the *Kariyarra* representatives during the ethnographic consultations and they expressed no opposition to the proposed development of the lot.

With regard to Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland, it is recommended that:

1. All surveyed areas documented in this report be granted archaeological and ethnographic clearance for ground disturbance to proceed;
2. The Department of Housing (WA), in discussion with Marapikurrinya Pty Ltd and the Kariyarra Native Title claimants, explore contracting and employment opportunities arising from the development of the land;
3. The Department of Housing (WA) should continue liaison with the Marapikurrinya Pty Ltd on behalf of the Kariyarra Native Title claimants in regards to the proposed development in the survey area. Consultation should be undertaken with the Kariyarra Native Title claimants in relation to the broader interpretation of Aboriginal cultural heritage throughout the proposed development;
4. The Kariyarra Native Title claimants should be provided with the opportunity to review, comment and participate in any subsequent archaeological and ethnographic investigations undertaken before and/or during development;

5. The Department of Housing (WA), in discussion with Marapikurrinya Pty Ltd on behalf of the Kariyarra Native Title claimants, should consider initiation of an appropriate process by which the results of this survey and any subsequent archaeological surveys in the project area may be made publically available, in due course, for consideration by consultants and researchers undertaking future archaeological studies of the Pilbara region. Such an initiative would facilitate building of the available knowledge base regarding Aboriginal occupation of north-west Australia and may result in on-going cumulative efficiencies for business and heritage-focussed research in the region;
6. If any Aboriginal objects and/or sites are identified during any proposed development, works must stop in the vicinity of the find, and the Department of Aboriginal Affairs (WA) be notified to identify the relevant legislative requirements and protocols to appropriately manage the Aboriginal objects and/or sites; and
7. If any human skeletal remains are identified during any proposed development works must stop in the vicinity of the find, and the Western Australian Police, in the first instance, should be contacted to identify the relevant legislative requirements and protocols to appropriately manage the remains.

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ABBREVIATIONS

Below is a list of abbreviations used in this report and their definitions.

Abbreviation	Name
ACHM	Aboriginal Cultural Material Committee
AHA	<i>Aboriginal Heritage Act 1972 (WA)</i>
AHIS	Aboriginal Heritage Inquiry System available from: www.daa.gov.wa.au
AHMS	Archaeological & Heritage Management Solutions Pty Ltd
C14	Radiocarbon date
DAA	Department of Aboriginal Affairs, WA
EPBC	<i>Environmental Protection & Biodiversity Conservation Act 1999 (Commonwealth)</i>
GDA 94	Geodetic Datum of Australia 1994
MGA	Map Grid of Australia
The Minister	Minister for Aboriginal Affairs, WA

SPATIAL ACCURACY

All spatial coordinates were recorded using a Garmin GPSMAP 60CSx in the GDA 94 datum and are accurate to within 15 metres. Unless otherwise stated, the spatial coordinates given in this report are in MGA Zone 50K.

1 INTRODUCTION

In March 2014, Cardno, on behalf of the Department of Housing (WA) engaged Archaeological and Heritage Management Solutions Pty Ltd (AHMS) to undertake archaeological and ethnographic Site Identification surveys for a proposed housing development at Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland, Pilbara, Western Australia. Representatives of the Kariyarra Native Title Claimants, as nominated by Marapikurrinya Pty Ltd participated in field surveys.

This report provides the results of the archaeological survey completed in this area. The results of the ethnographic survey are presented separately.

1.1 Survey Area

Lot 555 and Lot 9001 Murdoch Drive survey area lies approximately 20 km south of Port Hedland on the south eastern edge of South Hedland and is located immediately south of Murdoch Drive and west of the Outer Ring Road (Figure 1).

1.2 Project Brief

AHMS was commissioned by Cardno, on behalf of the Department of Housing (WA), to conduct ethnographic and archaeological Site Identification surveys at Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland, Pilbara, Western Australia.

The surveys were commissioned to determine whether or not proposed developments within the study area would result in impacts upon Aboriginal sites, objects or Aboriginal cultural heritage values. See Appendix 1 for heritage Legislative Obligations relevant to the study area

1.3 Project Objectives

The surveys were commissioned to determine whether or not the proposed development would result in impacts upon Aboriginal sites, objects or Aboriginal cultural heritage values within the survey area.

The specific aims of the study were to:

- Assess whether or not visible Aboriginal objects and/or sites and areas with potential to contain Aboriginal objects and/or sites exist within areas where development is proposed within the survey area;
- To identify localities within the proposed development area that are clear for development;
- To record identified archaeological sites to Site Identification level (see Department of Indigenous Affairs (WA) 2008);
- Through structured research questions, to undertake detailed analysis and discussion of any identified Aboriginal sites and/or features;
- To assess the scientific and cultural significance of the survey area and Aboriginal sites identified within the area during the survey work;
- To provide consideration and recommendations for the future management of the survey area; and
- To continue and maintain Aboriginal community consultation and involvement for the duration of the project.

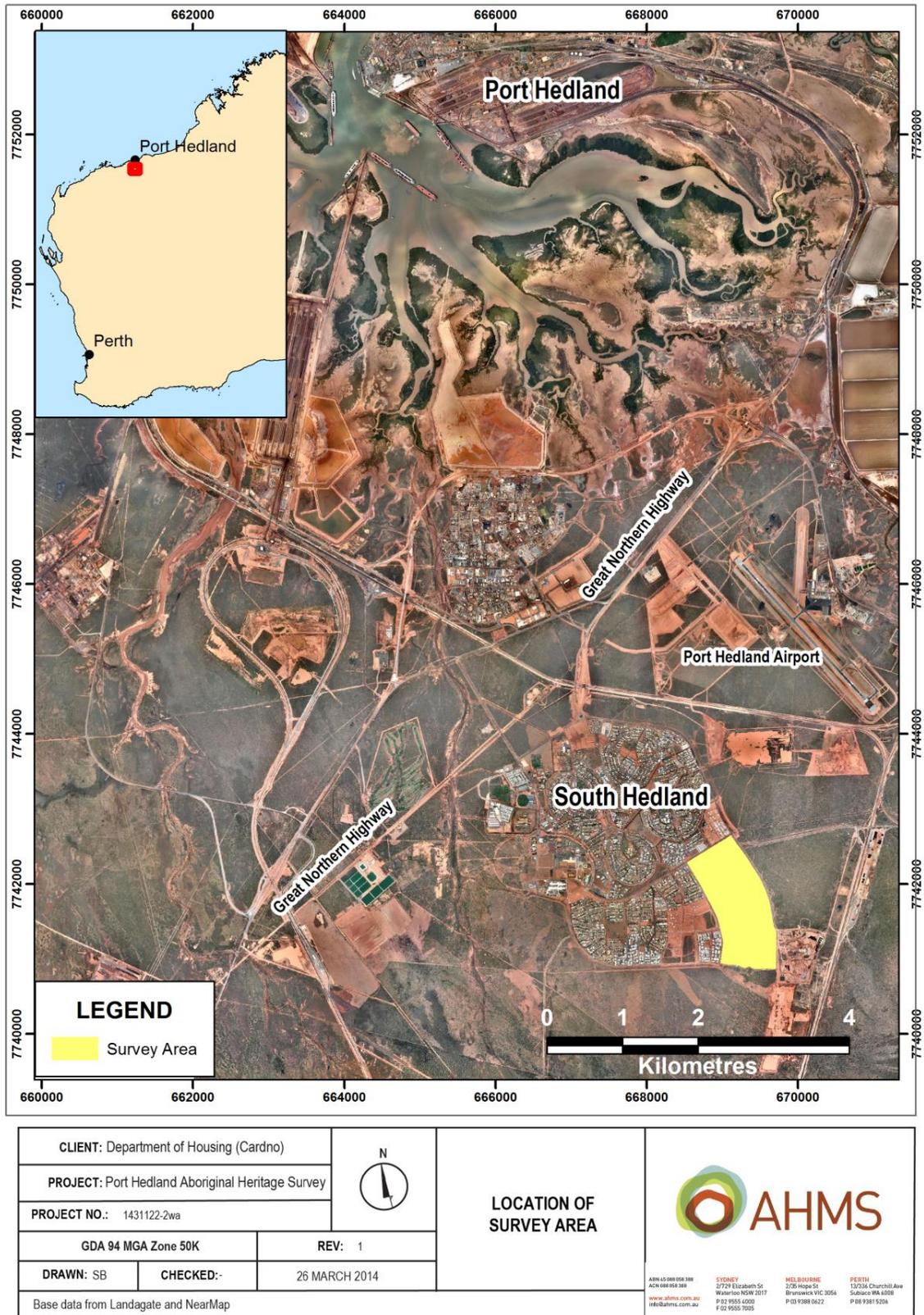


Figure 1. Location of study area

1.4 Timing

The archaeological recording was undertaken on Thursday 20 March 2014 and a preliminary advice was submitted to Cardno and Marapikurrinya for review on 27 March 2014. This draft report was submitted for comment on 22 April 2014.

1.5 Report Structure

The structure and content of this report follow guidelines issued by the DAA in the *Aboriginal Heritage: Site Identification Survey Brief* (DIA n.d.). This report provides advice that complies with the AHA, and other relevant acts, as detailed in Appendix 1. The report structure is as follows:

- Section 1 contains a description of the project and proposed development. Information covered includes the project brief, project objectives, timing, and authorship;
- Section 2 discusses the proposed development within the study area;
- Section 3 provides the research framework for the project, including the research questions;
- Section 4 discusses the methods used to undertake assessment and prepare this report. This includes any relevant research, Aboriginal consultation, the archaeological survey and reporting;
- Section 5 contains information regarding the environmental context of the survey area. This section covers a general background including landscape characteristics, soils and geology, vegetation and climate;
- Section 6 contains an overview of the Aboriginal history and European settlement in the region. This section discusses the Traditional Owners and their lifestyle as well as contact history with early settlers and the impact it had on the Aboriginal people;
- Section 7 comprises archaeological background information of the region in which the survey area is located. A search of the Aboriginal Heritage Inquiry System (AHIS) was conducted to obtain a list of registered Aboriginal sites found within the study area;
- Section 8 gives a description of the archaeological field survey results, including the Aboriginal community consultation;
- Section 9 contains a discussion of the work undertaken and conclusions regarding the extent to which the survey objectives were fulfilled; and
- Section 10 details the management recommendations that are given, following guidelines from the DAA, the results of the archaeological recording, and analysis of the impact of proposed development within the area surveyed.

1.6 Authorship

This report was written by John Tunn (Senior Heritage Consultant, AHMS) and reviewed by Dr Samantha Bolton (WA Manager, AHMS).

1.7 Acknowledgements

AHMS acknowledge assistance from the following persons during the survey and production of this report:

Kariyarra Native Title Group

Diana Robertson, Kerry Robinson, Leslie Ware, Charlie Counsellor, Thomas Monaghan and Kieran Geary (Plate 1).

Amergin Consulting

Bryn Coldrick and Dr Edward McDonald

Cardno

Lorraine Elliot and Ashwin Subramaniam



Plate 1. *Archaeological survey team (from left): Leslie Ware, Thomas Monaghan, John Tunn, Kieran Geary and Charles Counsellor (Photo: Coldrick, March 2014)*

2 PROPOSED DEVELOPMENT

The Department of Housing are proposing to develop land described as Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland for residential subdivision. Lot 555 is 112.3 ha and Lot 9001 is 4.5ha in size and situated south-east of an existing subdivision (Osprey).

3 RESEARCH QUESTIONS

This section sets out the research questions for the project. Research questions are incorporated into the research design to provide a realistic and effective basis for undertaking archaeological investigation (Heritage Branch Department of Planning (NSW) 2009: 27). It ensures that the data recovered makes "a meaningful contribution to our understanding of the past" (Iacono 2006: 78). A research design outlines a proposed methodology which is designed to address the research questions (Iacono 2006: 78).

3.1 Research Questions

The Project objectives are described in Section 1.3 and are drawn upon to design an appropriate research framework for the project that not only detects Aboriginal heritage sites on the landscape but, in the process, furthers our understanding of past Aboriginal occupation in the Pilbara. These questions include:

1. How long did Aboriginal people use the site?
2. What stone materials were used and where did they come from?
3. What types of artefacts were produced and what were they used for?
4. Is there any relationship between site function(s) and the local distribution of natural resources?
5. Was a wide or a very limited range of activities undertaken there by Aboriginal people? Either way, what does this tell us about site function(s) in the past?
6. Is there any relationship between site distribution and landform features and/or any insight into the taphonomic influences on artefact distribution and preservation? and
7. Does the survey area provide new information that may inform current thinking about the evolution of settlement patterning in the northern part of Australia?

The results from this survey can be used in conjunction with results from previous archaeological surveys to develop answers to these questions.

4 METHODOLOGY

The Site Identification recording required completion of a number of tasks including desktop research, Aboriginal community consultation and field survey. Specific details of the methods used to complete each task are described below.

4.1 Desktop Research

Desktop research completed to inform the survey work entailed:

- Searching the DAA Aboriginal Heritage Inquiry System (AHIS), in order to determine the type and distribution of Aboriginal sites that have been recorded in the study area;
- A review of previous archaeological investigations and studies carried out in the local area; and
- Preparation of a predictive model of the “archaeological potential” of the study area, including a prediction of the potential for unrecorded Aboriginal sites to exist within the proposed development area.

4.2 Aboriginal Community Consultation

Preliminary consultations were undertaken jointly by Amergin Consulting and AHMS with Diana Robinson of Marapikurrinya via telephone and email. The purpose of these consultations was to inform Marapikurrinya of the research and to make the necessary arrangements for the ethnographic and archaeological field surveys.

Marapikurrinya manages the conduct of Aboriginal heritage surveys on behalf of the Kariyarra Native Title claimants for the Port Hedland area, which is the Marapikurrinya clan estate. The Kariyarra people acknowledge that the Marapikurrinya clan estate exists in this country and that the Marapikurrinya family group has the right to talk for country and has decision-making rights for and about the Marapikurrinya clan estate under customary law.

4.3 Field Survey

An archaeological Site Identification survey was conducted within the study area. The aims of the survey were to:

- Systematically assess the study area and determine whether or not visible Aboriginal objects and/or sites and areas with potential to contain Aboriginal objects and/or sites exist within the area proposed for development;
- Identify localities within the survey area that are clear for development; and
- Record areas identified as Aboriginal heritage sites to Site Identification level (see DIA 2008).
- In addition, the survey area was assessed to determine the degree to which previous land use and landscape modification has disturbed the original landscape. An assessment of this disturbance and its implications for the preservation of archaeological deposits within the survey area was made.

The study area was traversed on foot by a five person survey team and, depending on terrain, visibility and obstacles, were spaced at 20 m - 50 m intervals. The team examined the ground surface for visible evidence of archaeological material such as flaked stone artefacts and shell.

5 ENVIRONMENTAL CONTEXT

Archaeological assessments include information about the environmental context of study areas because environmental factors influenced both the type and availability of natural resources and the cultural activities that took place in the past. In turn, both past and present anthropogenic activities and physical site formation processes determine the type and characteristics of the archaeological resource that may be preserved. As such, determination of the past and present environmental context is essential to develop accurate models of cultural activity, site distribution patterns and the archaeological potential of a given area. The environmental setting of the study area is discussed below.

5.1 Landscape Characteristics

Port Hedland is located in the northern Pilbara region of Western Australia, west of the Gibson Desert. The Pilbara region comprises a mixture of low level undulating terrain, steep slopes, plateaus (mesas), gullies and creek beds, dominated by the Hamersley and Chichester ranges and Fortescue and De Grey Rivers (CSIRO Australia 2006).

More specifically the subject land is located near the Pilbara coast on the Abydos Plain and appears as a relatively flat and sandy terrain. Subtle ephemeral drainage lines traverse the surrounding area with inundation levels fluctuating, depending on rainfall.

5.2 Soils & Geology

The Coastal Pilbara lies at the northern edge of the Western Shield, an ancient strata of Pre-Cambrian rocks which stretches from the far south of Western Australia to Port Hedland (Beard 1990). Both lie within the geological province known as the Pilbara Block. The Block is composed of a layered succession of Archaean Rocks that are believed to be around 3,000 million years old. It has two major facies; a greenstone/volcanic group which consists of metamorphosed andesite and basalt interleaved with fine-grained metamorphic rocks such as chert, and ironstones and, a sedimentary group, which is largely comprised of elastic sediments along with small quantities of volcanics.

Quaternary alluvium and aeolian deposits characterise the geology near the coast with red deep sandy duplexes and red sandy earths dominating the sandy coastal plains (Tille 2006: 89).

5.3 Vegetation

The survey area is within the Pilbara bioregion under the Biogeographic Regionalisation for Australia (IBRA) (ERIN 2005). Each bioregion is a geographically separate area of similar climate, geology, landform, vegetation and animal communities (Commonwealth of Australia 2009). Using Beard's (1990) classification, which predates the IBRA, the survey area lies within the Fortescue Botanical District of the Eremaean Botanical Province. The vegetation of this province is typically open and dominated by *Triodia* spp. (spinifex), *Acacia* spp. (wattle) and occasional *Eucalyptus* spp.

The coastal alluvial plains have soft spinifex grasslands on the loamy soils while clay soils support tussock grasslands including *Eragrostis* spp., *Astrebla pectinata*, and *Chrysopogon fallax*. *Eucalyptus camaldulensis* (river gum) and *Eucalyptus victrix* (coolabah) woodlands with soft spinifex and *Cenchrus ciliaris* (buffel grass) understorey are found on the active floodplains.

Vegetation noted during the survey was dominated by *Triodia* spp., with some *Acacia* spp. up to 2 m and *Hakea* spp. up to 2 m as well as other shrubs up to 0.5 m.

5.4 Fauna

The Pilbara landscape contains vast stretches of dry inland hinterland bordered by the Indian Ocean to its west. The diverse species of marine and terrestrial fauna that inhabit this area are specialised at living in the harsh and often unpredictable landscape. The terrestrial fauna of the Pilbara ranges from mammals and marsupials to reptiles, bird species and an abundance of insect life. The marine fauna contains similar diversity with marine mammals, reptiles, fish species and marine birds which occupy the riverine and ocean environments.

Some of the most common animals in the Pilbara include the red kangaroo (*Macropus rufus*), Rothschild's rock-wallaby (*Petrogale rothschildi*), brushtail possum (*Trichosurus vulpecular*), flying fox (*Pteropus polocephalus*), northern quoll (*Dasyurus hallucatus*), sand goanna (*Varanus gouldii*, also known as bungarra in some Aboriginal languages), dingo (*Canis lupus dingo*), pebble mound mouse (*Pseudomys chapmani*) and various frog and snake species. Common birds include the Australian bustard (*Ardeotis australis*, often referred to as a bush turkey), wedge-tailed eagle (*Aquila audax*), grey falcon (*Falco hypoleucos*), and emu (*Dromaius novaehollandiae*) (Department of Sustainability Environment Water Population and Communities 2009). Insects are the most abundant of all fauna, and this is no different for the Pilbara, which has many species of ants, termites, spiders, flies and mosquitos. These animals played an important part in Aboriginal life whether that was for food, clothing, company, or in their spiritual beliefs and stories.

All of these creatures would have had an impact on the preservation of Aboriginal archaeological material through the processes of bioturbation, trampling, or using the materials for nests. Compared to that of the large volume of European stock animals and pests introduced after colonisation the damage would have been minimal though (Engeman et al. 2012).

5.5 Climate

The Abydos Plain has a semi-desert tropical climate with average temperatures at Port Hedland ranging from 12 - 27°C in the winter to 25 - 36°C in the summer (Bureau of Meteorology 2011). Mean annual rainfall ranges between 250 - 350 mm, with a greater chance of summer falls (Bureau of Meteorology 2011). Approximately 80% of the rainfall occurs between January and July, with almost no rain falling between August and December. The region is affected by cyclones, with the north-west of Australia having the highest number of cyclones in the southern hemisphere (FMG 2004; Morse 2009) and the coast from Port Hedland to Exmouth Gulf being the most cyclone prone area in Australia (Bureau of Meteorology 2011).

6 ABORIGINAL HISTORY

This section presents a summary history of Aboriginal use and occupation of the survey areas based on available documentary evidence, including early ethnographic records. Historical land use and occupation is also summarised to provide context for discussion of factors that may have affected archaeological site survival.

6.1 The Traditional Owners

The first people known to have an association with the survey area were people of the Kariyarra or Kariera language group (Brown 1913, 145; Horton 1994: 536). The survey area is in the Northwest region of Aboriginal groups as classified by Horton (1994: 803), which contains 28 groups.

The Aboriginal people of the north-west were first described by Withnell in 1901 (Withnell 1901 [1965]-a). By way of general observation, he documented their belief systems, marriage laws and some of their customs. Of particular interest to archaeologists, Withnell also described methods and subjects of rock engravings (Withnell 1901 [1965]-a: 29), stone arrangements (thalu/tarlow) (Withnell 1901 [1965]-a: 5-6),¹ the use of barbed spears (Withnell 1901 [1965]-a: 30) and burial customs (Withnell 1901 [1965]-a: 36). He mentioned some of the groups that lived in the area, but did not detail the customs of individual groups.

The territory of the Kariyarra people extends between 3500 and 4000 square miles, with the three main rivers the Turner, the Yule and the Peawah running through it (Brown, 1913: 145). Brown (1913) describes mostly the territorial and relationship structure of the Kariyarra people, along with two other Aboriginal groups in the west (namely the Ngaluma and Mardudhunera Tribes).

The Aboriginal Traditional Owners have continually used and occupied the land covered by the project prior to the European settlement of the Pilbara region (FMG 2004). This continued use and occupation of the land is evidenced by the existence of Aboriginal communities such as Mugarinya and the Yandeyarra pastoral lease, Woodstock on the Woodstock/Abydos pastoral leases, Wirrilimara and Youngaleena on the Mulga Downs pastoral lease as well as Jigalong and various communities in and around the towns of Port Hedland, Marble Bar, Nullagine, Newman and Tom Price. Evidence of the long term occupation and use of the region by the Aboriginal Traditional Owners is reflected in the richness and variety of the cultural heritage sites that are found in abundance throughout the region today.

6.2 The Kariyarra People

The Kariyarra people live in coastal Pilbara on the Yule and Turner Rivers. Their neighbours include the Ngarluma, Yindjibarndi, and Nyamal groups (Horton 1994: 778).

6.2.1 Economic Resources

By studying ethno-historical accounts, aspects of traditional Aboriginal lifestyle and economy can be reconstructed. Accounts of Aboriginal people living in the Port Hedland – Newman region are limited, with the observations of Brown (1913) being amongst the earliest. Occupying both coastal and inland regions, the Kariyarra people have had access to a range of resources in the area, ranging from coastal shell materials to a range of geological materials.

¹ A thalu is also known as an 'increase site'. They are sites used to perform a ceremony to produce an abundant supply of the associated plant, animal or other object. The archaeological component usually consists of a stone arrangement, such as a pile of stones. (Brown 1987: 18)

Ethnographic information describes the people of the Abydos Plain region as river people (Withnell 1901 [1965]-b) and comparisons have been made between the subsistence patterns on the Abydos Plain and the Western Desert (Clune and Harrison 2009). The development of settlement/subsistence models of the wider Pilbara region (Smith 1988; Veth 1989) indicate that the archaeological signature of semi-arid and arid regions would, be characterised by:

- Many small sites associated with ephemeral water sources;
- A smaller number of larger sites, adjacent to more permanent water; and
- Special purpose, task specific sites, such as stone quarries, located where conditions permit such as around outcrops of siliceous stone.

The study area is within one of the driest regions in Australia, the effects of which can be seen in the ways people adapted to the scarcity of water and the preservation of archaeological material. Access to water has a direct influence on where sites were located, how long they were occupied, the frequency of occupation and consequently their size. Periods of semi-sedentism may have occurred immediately after the wet season when resources were abundant (FMG 1994:4).

6.2.2 Use of Trees/Grasses

A variety of tree species were used as wood sources for food containers and the manufacture of tools and implements. For example:

- Clubs, spears, throwing sticks and shields (Withnell 1901 [1965]-a: 2; Clement 1903: 5);
- Wooden scoops and the bark from *Melaleuca* spp. trees used by women for seed gathering (Withnell 1901 [1965]-a: 2);
- *Melaleuca* spp. was also used for ceremonial purposes and to cover the corpses of the dead (Withnell 1901 [1965]-a: 6, 36);
- Babies were wrapped in and carried with *Melaleuca* spp. bark (Withnell 1901 [1965]-a: 8);
- Nets were made from reeds and spinifex (Withnell 1901 [1965]-a: 19, 21);
- Boughs and nets were used to build a trap by a river to catch kangaroos (Withnell 1901 [1965]-a: 19-20; Clement 1903: 2);
- Boughs and twigs were used to cover pits for catching game (Withnell 1901 [1965]-a: 21);
- Saps and gums, particularly from spinifex, were used as adhesives;
- Roots, berries, leaves and fruits were collected for processing as foods, drinks, tobacco and medicaments (Withnell 1901 [1965]-a: 23-24); and
- Spinifex was used for fishing nets.

In addition to providing the raw materials needed to make products used in everyday life, trees also attracted birds and animals.

6.3 Contact History

6.3.1 Non-Indigenous Occupation in the North-West

The inland region of the north-west of Western Australia was not extensively explored by non-Indigenous people until Francis Gregory's expedition in 1861 (Battye 1924: 258). Gregory, looking for a suitable place to establish a colony, travelled north through the Hamersley Ranges, exploring the Fortescue, Sherlock and Oakover Rivers, as far as the De Grey River, before returning south via the Strelley, Yule and Sherlock Rivers (Gregory and Gregory 1884: 52-94). Following his favourable report, occupation of the region by non-Indigenous people commenced in 1863 on the De Grey River (Battye 1924: 262-263). Individual settlements by pastoralists followed and in 1866 the town of Roebourne was established (Battye 1924: 271-272). Explorations and settlement of the area continued throughout the 1870s, until the search for more pastoral land shifted attention to the Kimberley region to the north (Battye 1924: 326). This pattern of early non-Indigenous settlement is

reflected in land use today. There are few towns, and most of the region is used for pastoral land or mining, which is a relatively recent episode in the Pilbara's land use history.

6.3.2 Impact on Aboriginal People of the North-West

As with Aboriginal people throughout Australia, the traditional life of the north-west was broken through the course of the nineteenth and twentieth centuries. The introduction of diseases such as smallpox and influenza wreaked havoc among the Aboriginal population, with individual epidemics killing large numbers of people.

Early white settlement of traditional hunting lands deprived Aboriginal groups of sources of food and access to camping and ceremonial sites. This forced individuals to either relocate into the potentially hostile lands of neighbouring Aboriginal groups, to partially integrate into colonial society as fringe dwellers, or to resist. White settlers and the colonial administration often met resistance by Aboriginal groups with retaliatory actions. The Aboriginal people of the north-west often killed white settlers. In retaliation and in order to protect themselves, the settlers killed many Aboriginal people, although they were rarely punished for it (Battye 1924: 304-305). A combination of these factors led to the demise of traditional lifestyles and a decrease in the Aboriginal population in the Pilbara region.

7 REGIONAL ARCHAEOLOGICAL CONTEXT

The distribution of known sites in relation to environment and topography are routinely examined in order to define identifiable site location patterns, in addition to any regional and local trends in the archaeological record of an area where archaeological investigation is planned. This form of existing data analysis often provides evidence about past economic and social systems and may also assist in predicting likely site types, site locations and the nature of the archaeological resource in the area.

The following sections describe the results of this analysis of the survey area.

7.1 General Background

A number of regional, local and smaller-scale archaeological investigations have been previously undertaken within the region, resulting in one of the most remote areas of Australia becoming one of the most active areas for archaeological investigation. Archaeological excavation in this region has uncovered some of the oldest occupation sequences on the continent (see Maynard 1980; Brown 1987: 27 citing; Troilett 1982; Veth 1995: Table 1; Marwick 2002; Edwards and Murphy 2003; Morse 2009; Slack et al. 2009; Law et al. 2010; Hughes et al. 2011). Indeed, since the late 1970s sites dating to over 20,000 years old have been located at a steady rate across the Pilbara - particularly in the arid uplands.

While there is a natural curiosity or interest in the archaeology of this region, the main driver for this heightened level of activity is the mining industry, which has become increasingly active in the Pilbara since the 1960s. Since this time numerous heritage studies have been completed. Regional archaeological assessments endeavour to provide interpretations associated with broad settlement patterns, resource and material redistribution and site functions and exchange. In addition, these assessments have also specifically sought to determine the archaeological indicators for each of these various themes. Observations of diachronic change in the archaeological record have largely been explained in terms of environmental changes and increasing regional aridity, both during and after the Last Glacial Maximum (LGM), and the associated effects of sea-level fluctuation between about 29,000-15,000 cal. yrs. BP (Brown 1987; Veth 1989; Slack et al. 2009).

The most common site type in the inland Pilbara is stone artefact scatters (Ryan and Morse 2009: 6). Other common types are rock shelters, ochre and stone quarries or sites with engravings. The distribution, density and size of sites are largely dependent on environmental context. For instance, rock shelters are only found in areas of exposed escarpments and grinding grooves are found on areas of exposed flat-bedded rock near a source of water. Middens are found in close proximity to marine, estuarine and less often, freshwater bodies.

7.2 Early Occupation

Radiocarbon (C14) dates retrieved from excavated sites at Juukan-1, Hamersley Plateau (33,000 BP), Newman Rockshelter (P2055) and Mount Newman (26,000 BP)² indicate that Aboriginal occupation in the region dates to the Pleistocene period (i.e. over 10,000 years before present [BP]).

Models of the timing and nature of occupation of Australia's arid zones propose that they were not permanently occupied until the early or mid-Holocene (Smith 1988; Veth 1989). More recently published radiocarbon dates from the Pilbara region, such as those described above in addition to

² Juukan-1, Hamersley Plateau (32,950 ± 270 BP, Beta 249759) (Slack et al. 2009: 34) and Newman Rockshelter (P2055), Mount Newman (26,300 ± 500 BP, SUA 1510) (Brown 1987; cited in Morse 2009: 4).

others with dates from around 20,000 BP (e.g. Veitch et al 2005; Marwick 2002) indicate that this region was occupied prior to the Holocene period.

All of the Pleistocene C14 dates published/available to date are from rock shelters located on the Hamersley Ranges, between the Fortescue and Ashburton Rivers and south of the survey area. The Hamersley Ranges is considered to have been a refuge during the Last Glacial Maximum (LGM, c.23,000 - 15,000 BP³), that is, an area containing reliable sources of water and therefore moist-adapted plants (Veth 1989: 81). The area of the Great and Little Sandy Deserts, to the north and east of the Hamersley, are barriers comprising desert areas characterised by uncoordinated and internal drainage (Veth 1989: 81) and are generally considered to be uninhabitable. According to Veth's classification, the survey area is located in the Hamersley Range refuge area (Veth 1989: 84).

Although radiocarbon dating indicates that the Pilbara region was occupied during the Pleistocene, the above classification implies that occupation was limited to areas of adequate resources, such as the refuges around the Hamersley Ranges. Permanent occupation of the barrier regions of the deserts did not occur until the Holocene period. Occupation of the barrier area during the Pleistocene was defined by brief and intermittent visits by small groups of people (Brown 1987; Marwick 2002; cited in Ryan and Morse 2009: 6).

Closer to the survey area itself, the Abydos Plain contains an abundance of rock engravings (see also Bednarik 2002). Similar engravings are found elsewhere in the Pilbara notably on the Burrup Peninsula adjacent to the towns of Dampier and Karratha. Relative dates for engravings near Woodstock/Abydos pastoral leases range between 160 and 11,545 years BP (Bednarik 2002), while engravings on the Burrup Peninsula have been dated to at least 27,000 years old (Mulvaney 2011). The engravings located on the Woodstock and Abydos pastoral leases near the upper reaches of the Yule and Turner Rivers, first described by Worms (1954), are listed on the Register of the National Estate. This area is also a Protected Area under the AHA. Around South Hedland, known sites are dominated by shell midden and stone artefact scatter sites which are clustered to the north of the study area and closer to the coast. These middens comprise predominantly *Andara grandosa* shells and occur near the mouths of water courses and extend inland along these watercourses (Veth and O'Brien 1986).

7.3 Intensification during the Holocene Period

The majority of C14 dated sites in the Pilbara region are less than 4000 years old (80% of the 126 dated sites) (Morse 2009: 2). It has been argued, for other parts of Australia, that this is the result of increased populations and 'intensification' of cultural activity during this period (see Lourandos and Ross 1994 for a discussion of the 'Intensification Debate'). However, the prevalence of sites dating to the last 4000 years may actually be a product of one or more of (i) cultural change, (ii) research and/or (iii) preferential preservation (see Ward 2004).

Along the continental shelf and parts of the adjacent coastline there will have been a loss of late Pleistocene and early Holocene sites as a result of the post-glacial sea-level transgression. The rapid rise from a sea level low of 120 m below present (during the LGM) to a sea level high of at least 1 m above present around 5500 years ago (Wyrwoll et al. 1995) would have submerged many of the older sites along the continental shelf and forced many Aboriginal groups further inland. The sea-level highstand may have persisted until around 2500 years ago before falling back to present day sea levels (Lessa and Masselink 2006).

³ Exact dates vary, with estimations ranging from 25,000-15,000 (Bahn 1992) to 22,000-19,000 (Yokoyama et al. 2000: 713). The range given is a conservative estimate based on the more recent publications (Mulvaney and Kamminga 1999: 114; Yokoyama et al. 2000: 713).

7.4 Aboriginal Heritage Inquiry System

A search of the AHIS was undertaken to identify previously recorded Aboriginal sites within and around the study area. The status of a site can be categorised in four different ways. These are:

- Lodged (L) – The site information has been lodged with the DIA and is awaiting assessment;
- Registered (R) – The Aboriginal Cultural Material Committee (ACMC) decision has been made and the site is now a registered Aboriginal site;
- Insufficient Information (I) – The ACMC decision has been made and there is insufficient information to determine whether the site is an Aboriginal site in accordance with Section 5 of the Aboriginal Heritage Act 1972 (WA) (AHA); and
- Stored Data (S) - The ACMC decision has been made and the site does not fulfil any of the criteria under Section 5 of the AHA.

Sites that have insufficient information or have been lodged are protected in accordance with Section 17 of AHA, until a full assessment is made by the ACMC, and it is determined whether or not they are Aboriginal sites.

There are currently no previously registered sites, ethnographic sites or other heritage places listed within the study area.

Within 5 km of the survey area there are no registered ethnographic sites, however there are five registered archaeological sites, all listed as 'Midden/Scatter' (see Appendix 2 for a description of Aboriginal heritage site types). When the broader Port Hedland area is investigated, additional Aboriginal heritage sites are registered and several archaeological and ethnographic surveys have been undertaken. The majority of these records relate to Aboriginal shell middens and flaked stone artefact scatters and are situated in close proximity to the coast and near the mouths of watercourses and extending inland along these drainage lines.

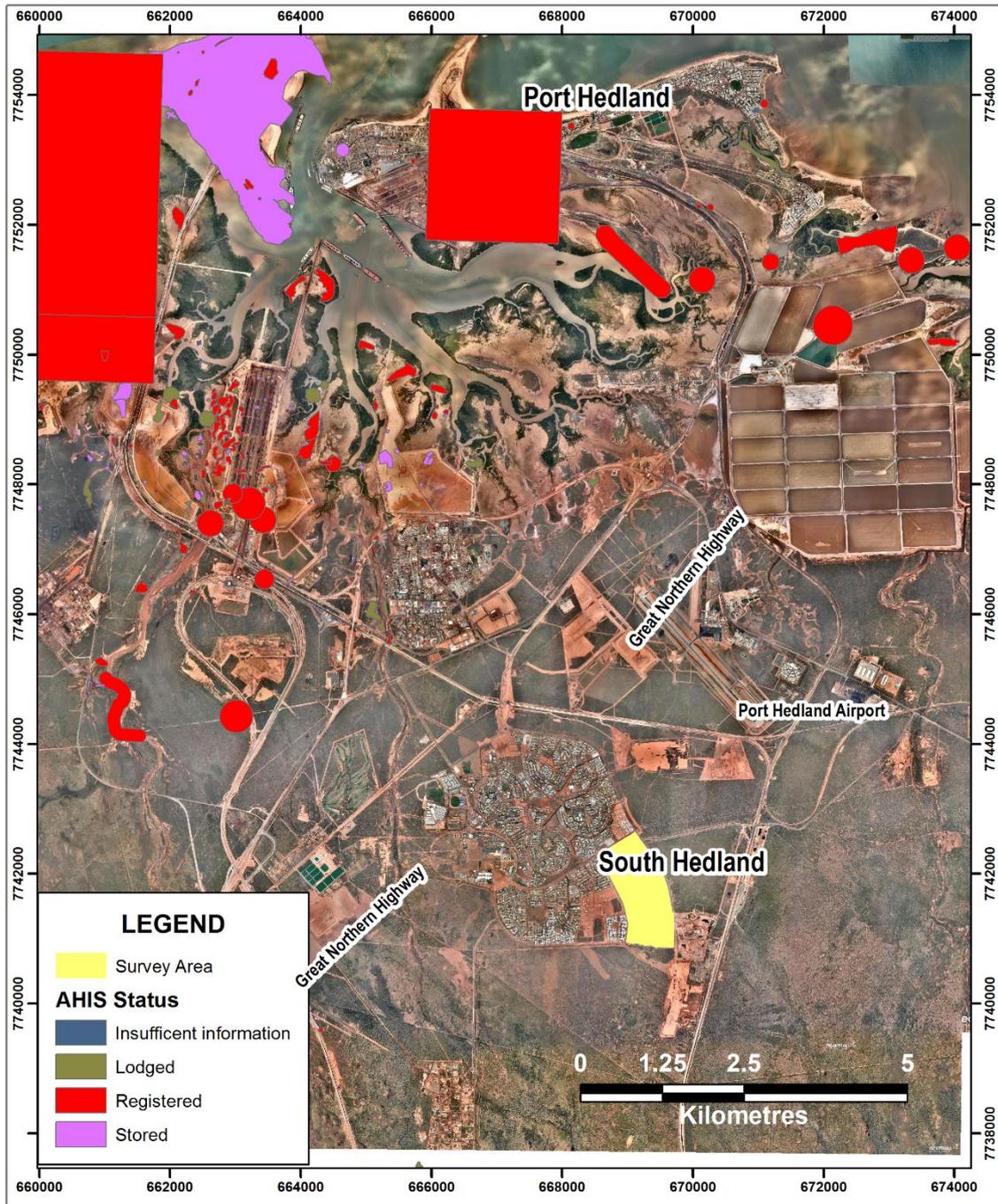
Table 1. Registered Aboriginal sites within 5 km of study area

DAA Site ID	Site Name	Status	Site Type
23548	FMG PAR 06-01	R	Midden/Scatter
23611	FMG PAR 06-08	R	Midden/Scatter
23605	FMG PAR 06-02	R	Midden/Scatter
23606	FMG PAR 06-03	R	Midden/Scatter
26701	LAN 08-04	R	Midden/Scatter

A further search was carried out encompassing a 100 km x 100 km square buffer around the study area and revealed 573 registered sites, listed under the site types shown in Table 2 below (also see Figure 2). None of these sites are within the study area.

Table 2. Summary of listed site types located within 100 km of study area

Site Type	Number	Percentage of total
Artefacts	161	28.0
Ceremonial / mythological / human-made structure	78	13.5
Engraving	75	13.0
Grinding	95	16.5
Midden	128	22.4
Quarry	16	3.0
Repository	1	0.2
Skeletal Material	13	2.2
Restricted	6	1.2
TOTAL	573	100



CLIENT: Department of Housing (Cardno)			DAA LISTED SITES WITHIN VICINITY OF STUDY AREA	
PROJECT: Port Hedland Aboriginal Heritage Survey				
PROJECT NO.: 1431122-2wa				
GDA 94 MGA Zone 50K		REV: 1		
DRAWN: SB	CHECKED:-	17 APRIL 2014		
Base data from Department of Aboriginal Affairs (WA), Landgate and NearMap				
<small>AHMS 45 888 096 388 ACN 688 958 388 www.ahms.com.au info@ahms.com.au</small>		<small>SYDNEY 2/79 Elizabeth St Waterloo NSW 2017 P 02 9555 4200 F 02 9555 7055</small>	<small>MELBOURNE 2/25 Hope St Brunswick VIC 3056 P 03 9388 8422</small>	<small>PERTH 13/234 Churchill Ave Subiaco WA 6008 P 08 9381 5206</small>

Figure 2. Previously registered Aboriginal sites within vicinity of study area

Several Aboriginal heritage surveys have been conducted around South Hedland and the broader region. However, many of these are either not publicly available or not directly relevant to the study area. A summary of the results from those that are both available and relevant is given below (Table , Table).

In general shell middens are situated on low, raised sand dunes that lay in close proximity to ephemeral creek systems. These midden sites probably represent short-term, seasonal usage of marine resources (Jackson and Green 2006b: 71). The middens consisted almost exclusively of *Anadara granosa*, a mudflat-dwelling shell, and reflect a cultural preference over mangrove-dwelling *Terebralia* rather than an environmentally-determined response. The shell scatters reflect diffuse discard and transient site use and also post-depositional modification, associated with periodic flooding and erosion of the ephemeral creek systems (Jackson and Green 2006b: 72).

The grinding patches (see Table , Table) reported were predominantly found in inland areas, which contrasts with the prevalence of midden sites nearer to the coast and provides contrasting evidence of subsistence behaviour of Aboriginal groups in the north-west. The grinding patches would have been used by women for seed grinding (Mattner 2009: 31).

Stone artefact types included flakes, single platform cores and mullers (Jackson and Green 2006a) (see Appendix 3 for a discussion of stone artefact identification and types).

Table 3. Summary of archaeological sites where available (Gavin Jackson Pty Ltd and Anthropos Australis Pty Ltd 2006; Jackson and Green 2004; 2006b)

Site	Easting	Northing	Site Type	Size (m) NS x WE
FMG PAL VII 06-01	700786	7583829	Engravings, grinding patches and artefacts	218 x 156
FMG PAL VII 06-02	701045	7583069	Engravings, grinding patches and artefacts	341 x 292
FMG PAL VII 06-03	702000	7578931	Grinding patches	63 x 82
FMG PAL VII 06-04	702262	7578706	Grinding patch	24 x 21
FMG PAL VII 06-06	707483	7573070	Grinding patch	42 x 38
FMG PAL VII 06-07	707676	7572875	Grinding patch, engravings and artefact scatter	190 x 163
FMG PAL VII 06-08	708224	7572735	Grinding patch and engraving	21 x 25
FMG PAL VII 06-12	712860	7571512	Artefact scatter	171 x 192
FMG PAL VII 06-18	700795	7583604	Grinding patches	34 x 30
FMG PAL VII 06-19	700864	7583486	Grinding patches	146 x 97
FMG PAL VII 06-21	709643	7572326	Grinding patches	80 x 77
FMG PAL VII 06-23	723377	7565568	Grinding patches	83 x 113
FMG PAL VII 06-24	706830	7569013	Grinding patch	20 x 20
FMG PAL VII RAR 06-02	723212	7565806	Engraving and grinding patch	31 x 25
FMG PAL VII RAR 06-03	723340	7565726	Grinding patches	82 x 61
FMG PAL IX 06-01	744750	7529971	Artefact scatter	41 x 39
FMG PAL IX 06-02	735111	7543308	Rock shelter	25 x 25
FMG PAL IX 06-03	744263	7530266	Artefact scatter	75 x 46
FMG PAL IX 06-06	741411	7532646	Artefact scatter	129 x 103

Site	Easting	Northing	Site Type	Size (m) NS x WE
FMG PAL IX 06-07/08	741555	7532657	Artefact scatter	72 x 95
FMG PAL IX 06-12	737724	7536941	Artefact scatter	30 x 30
FMG PAL VIII 06-02	733793	7548818	Grinding patch and associated artefacts	53 x 77
FMG PAL VIII 06-04	726832	7557764	Artefact scatter	43 x 41
FMG PAL VIII 06-06	726253	7558602	Artefact scatter	47 x 48
FMG PAL VIII 06-08	727371	7557021	Scarred tree	20 x 20
FMG PAL VIII GT 06-02	727025	7557443	Artefact scatter	120 x 115
FMG PAL VIII RAR 06-01	733725	7548649	Grinding patches	38 x 39
FMG PAL VIII RAR 06-02	729858	7553790	Artefact scatter	146 x 114
FMG PAL VIII RAR 06-03	728184	7555909	Artefact scatter	102 x 105
FMG PAL VIII RAR 06-05	727542	7556760	Artefact scatter	86 x 105
FMG KAR 06-01	692851	7634815	Grinding patches	52 x 65
FMG KAR 06-02	692939	7634578	Grinding patches	29 x 18
FMG KAR 06-03	692984	7633986	Engravings	131 x 100
FMG KAR 06-04	692894	7634332	Grinding patches, artefacts	30 x 47
FMG KAR 06-05	692913	7634385	Grinding patches	15 x 15
FMG KAR 06-06	693076	7633479	Grinding patches	36 x 32
FMG KAR 06-07	693474	7632478	Grinding patches	52 x 61
FMG KAR 06-08	693570	7631929	Grinding patches, artefacts	28 x 30
FMG KAR 06-09	693517	7632012	Grinding patches	16 x 26
FMG KAR 06-10	693648	7632208	Grinding patches	15 x 15
FMG KAR 06-11	693616	7632170	Grinding patches	25 x 27
FMG KAR 06-12	693713	7632064	Grinding patches	15 x 15
FMG KAR 06-13	693990	7630345	Engravings	173 x 49
FMG KAR 06-14	694424	7628890	Grinding patch	15 x 15
FMG KAR 06-15	694493	7628769	Grinding patch	15 x 15
FMG KAR 06-16	694549	7628782	Grinding patches	34 x 33
FMG KAR 06-17	694855	7627750	Engravings, grinding patches, artefacts	> 284 x > 145
FMG KAR 06-18	695635	7624500	Engravings, grinding patches, artefacts	> 622 x > 283
FMG KAR 06-19	699089	7613592	Grinding patches	127 x 73
FMG KAR 06-20	699186	7613916	Grinding patches	15 x 15
FMG KAR 06-21	699329	7613955	Grinding patches, artefacts	48 x 26
FMG KAR 06-22	699412	7614136	Grinding patches, artefacts	49 x 40
FMG KAR 06-23	699287	7616024	Grinding patches	52 x 40
FMG KAR 06-24	699375	7614033	Grinding patch	15 x 15
FMG KAR 06-25	695711	7624131	Artefact scatter	50 x 58
FMG PAR 06-01	665357	7745637	Shell scatter	66 x 179

Site	Easting	Northing	Site Type	Size (m) NS x WE
FMG PAR 06-02	665074	7745832	Shell scatter	156 x 63
FMG PAR 06-03	665097	7745778	Shell scatter	88 x 68
FMG PAR 06-04	664942	7745839	Shell scatter	67 x 12
FMG PAR 06-05	663850	7746549	Artefact scatter	149 x 204
FMG PAR 06-06	665295	7746107	Shell midden	54 x 250
FMG PAR 06-07	664638	7746184	Shell midden	10 x 10
FMG PAR 06-08	665229	7745815	Shell scatter	94 x 144
FMG PAR 06-09	665734	7746020	Shell scatter	224 x 295

Table 4. Summary of archaeological data from Mattner (2009)

Site Name	Site Type	Site Dimensions (m)	Location	Comments
Rail 08-41	3 grinding patches	19 x 9 (NE/SW x NW/SE)	Granite outcrop	Site truncated and partially buried
Rail 08-43	48 grinding patches	80 x 45 (NE/SW x NW/SE)	Gneissic/ granite outcrop	Partial damage by construction and also from scouring during floods
Rail 08-44	9 grinding patches	18 x 22 (EW x NS)	Gneissic/ granite pavement	Site disturbance and severe weathering from runoff
Rail 08-34	14 grinding patches	20 x 60 (EW x NS)	Gneissic/ granite slab	Slight disturbance from rail construction
Rail 08-16	4 grinding patches, 1 engraving	39 x 19 (NE/SW x NW/SE)	Granite outcrop	Considerable disturbance and weathering

7.5 Summary

The DAA's survey database (AHIS) does not show any previous Aboriginal heritage surveys having taken place within the survey area. However, one survey is listed in adjacent area immediately to the north (Ibbitson and Parker 2005) and numerous archaeological surveys have been conducted in the surrounding region between 2001 to 2009. A number of ethnographic surveys have also been conducted in the surrounding area (e.g. Coldrick and McDonald 2012b; 2012a; Anthropos Australis Pty Ltd 2008; 2012; De Gand 2005; Haydock and Bunting 2006; O'Connor 1987). However, as far as can be ascertained, no ethnographic sites have been reported within the current survey area as a result of any of these previous surveys.

The analysis found that a variety of site types are present in the area. The majority of sites found within the broader region are artefact scatters and grinding patches. The latter are either isolated or associated with engravings and/or artefacts. Engraving sites, shell scatters, shell middens, rock shelters, a scarred tree and a quarry were also noted. However, in areas closer to the coast and nearby South Hedland the predominance of seed-grinding patches in inland areas gives way to higher numbers of midden sites, providing contrasting evidence of subsistence behaviour of Aboriginal groups in the north-west.

7.6 Site Predictions

Using the data collected from available reports, we are able to gain an understanding of the type of sites, site size, lithologies and artefact types identified at sites which will assist in an analysis of the archaeological landscape.

Ethnographic information describes the people of the Abydos Plain region as river people (Withnell 1901 [1965]-b) and comparisons have been made between the subsistence patterns on the Abydos Plain and the Western Desert (Clune and Harrison 2009).

The topography and distribution of natural resources associated with the survey area indicates a potential for the site types described above. From this informed position it is now reasonable to make the following predictions regarding the survey area:

- Isolated finds could be located anywhere across the survey area.
- Artefact scatters have a moderate potential to occur on undisturbed flat dry landforms;
- Shell middens have a moderate potential to occur around the mouths of watercourses and along their margins further inland; and
- Portable grinding implements have a moderate potential to occur on undisturbed flat dry landforms.

It is unlikely that rock shelters, grinding patches, quarries, stone arrangements or scarred trees will be present within and immediately around the study area.

8 SURVEY RESULTS

This section presents the archaeological results of the Site Identification Recording, including the outcomes of the Aboriginal Community Consultation.

8.1 Aboriginal Community Consultation

The areas comprising the study area are within the country of the Kariyarra who have a registered Native Title claim over the area (Federal Court file number WAD6169/1998, Tribunal file number WC1999/003). The Kariyarra are represented by Marapikurrinya.

Consultation with the Kariyarra Native Title claimants included:

- Consultation with Marapikurrinya on behalf of the Kariyarra Native Title claimants via telephone and in person;
- Participation of Kariyarra Native Title claimant representatives in the archaeological survey; and
- Consideration of the views and recommendations of the Kariyarra Native Title claimants regarding the cultural heritage significance of the study area.

8.2 Area Surveyed

The coordinates of the area surveyed are listed in Table , below (also see Figure 3).

Table 5. Coordinates of area surveyed

Point Number	Easting	Northing
1	669109	7742651
2	669315	7742364
3	669497	7742076
4	669566	7741928
5	669617	7741780
6	669683	7741437
7	669715	7741366
8	669710	7740873
9	669435	7740862
10	669353	7740900
11	669300	7740885
12	669259	7740894
13	669185	7740921
14	669103	7740919
15	668972	7740947
16	669008	7741232
17	668963	7741440
18	668929	7741556
19	668705	7741996
20	668527	7742289



Figure 3. Detail of survey area. Ground disturbance (large open drain infrastructure, construction camp, quarried areas and various vehicle tracks are visible)

8.3 Survey Coverage

Ground surface visibility across the survey area varied from 0-100%, with an estimated average visibility of approximately 20%, and is classified as poor. The ground surface was variously obscured by vegetation, dumped rubbish and/or the effects of prior ground disturbance (Figure 3). Various informal gravel vehicle tracks traversed the survey area and illegally dumped rubbish was common - particularly in the southern half of Lot 555. On the western boundary of the lot a large, fenced construction storage area had been established while much of the northern and central areas has been significantly disturbed by the construction of a large stormwater drain (approximately 30 m wide) and what appears to be a sand quarry (see Plates 2 and 3). These factors greatly reduced assessment visibility and the ability to detect archaeological materials. Nevertheless, AHMS are confident that the coverage achieved was sufficient and appropriate for the purpose of identifying archaeological sites that meet the criteria under section 5 of the AHA.

8.4 Archaeological Results

The archaeological survey was undertaken on Thursday 20 March 2014 by John Tunn (AHMS) and Bryn Coldrick (Amergin) with the cooperation and participation of Leslie Ware, Charlie Counsellor, Thomas Monaghan and Kieran Geary (Kariyarra Native Title claimants).

No archaeological features or sites, as defined by section 5 of the *Aboriginal Heritage Act 1972* (WA) (AHA), were located during the survey.

The Kariyarra representatives requested that appropriate procedures be put in place in order to manage any currently unidentified Aboriginal heritage values (e.g. cultural material or skeletal remains) that are potentially encountered during ground disturbance works.



Plate 2 Open drainage infrastructure on the western edge of survey area - looking south



Plate 3 Significantly disturbed quarry area in the north-east section of survey area - looking south

9 DISCUSSION AND INTERPRETATION

If undertaken using an unbiased method and approach, the results of any field survey are able to provide a valuable reference from which distribution patterns can potentially be recognised and distilled into a series of informed statements which, theoretically, can predict the location of archaeological sites. As new work is completed and information accumulates, an opportunity exists for continual review and testing of these predictions with the aim of elevating any model to a higher level of reliability with each revision – one which is based upon qualitative data and increased survey coverage.

At Lots 9001, 570-572 and 574 in South Hedland flaked and ground stone artefacts, in an open context, are predicted to have the greatest likelihood of occurring. In several areas, dense vegetation combined with significant ground disturbance and evidence of rubbish dumping affected the ability to detect archaeological materials however, in those areas that presented effective survey conditions, no archaeological materials were identified.

Although a lack of any physical traces makes addressing questions regarding the timing, nature and function of Aboriginal occupation difficult (see Section 3), the results and lack of any material can contribute meaningfully to a broader and developing understanding of site distribution. The predicted moderate potential for artefacts scatters to occur on these undisturbed flat landforms could arguably be revised downward and appears to be the case when the results of a similar assessment undertaken on housing lots to the immediate north (no archaeological material identified) are taken into consideration (Ibbitson and Parker 2005). The archaeological record associated with these relatively flat, sandy hinterland landscapes (associated with the study area and surrounding areas) is, in all likelihood, confined to discrete isolated artefacts and barely detectable.

10 MANAGEMENT STRATEGY

Background research predicted that given the location of the study area and the results of previous archaeological assessments undertaken in adjacent lots there was a moderate potential for Aboriginal heritage sites to exist within the survey area. Although there were no heritage sites identified during the survey, there remains some potential for surface and/or subsurface archaeological sites to exist. Any future development planned outside those areas surveyed during the current investigation should also be the subject of an archaeological survey prior to development.

Under Section 17 of the AHA it is an offence to excavate, destroy, damage, conceal or in any way alter any Aboriginal site. It is also an offence to in any way alter, damage, remove, destroy, conceal, or deal with in a manner not sanctioned by relevant custom, or assume the possession, custody or control of, any object on or under an Aboriginal site without consent from the Minister for Aboriginal Affairs (WA) in accordance with Section 16 or Section 18 of the AHA. Therefore Section 18 approval is required prior to further work in any areas identified as potential Aboriginal heritage sites.

Results from this and previous heritage surveys indicate that there is potential for Aboriginal archaeological sites to exist within the proposed development area. Consequently, any future development planned outside those areas surveyed for the current investigation, should also be the subject of an archaeological survey prior to development.

10.1 Recommendations

The following recommendations are based upon:

- Guidelines provided by the Western Australian Department of Aboriginal Affairs;
- Results of the archaeological and ethnographic investigations documented in this preliminary advice;
- Consultation with the Kariyarra Native Title representatives during the survey; and
- An analysis of the impact of development.

With regard to Lots 9001, 570-572 and 574, Murdoch Drive, South Hedland, it is recommended that:

1. All surveyed areas documented in this report be granted archaeological and ethnographic clearance for ground disturbance to proceed;
2. The Department of Housing (WA), in discussion with Marapikurrinya Pty Ltd and the Kariyarra Native Title claimants, explore contracting and employment opportunities arising from the development of the land;
3. The Department of Housing (WA) should continue liaison with the Marapikurrinya Pty Ltd on behalf of the Kariyarra Native Title claimants in regards to the proposed development in the survey area. Consultation should be undertaken with the Kariyarra Native Title claimants in relation to the broader interpretation of Aboriginal cultural heritage throughout the proposed development;
4. The Kariyarra Native Title claimants should be provided with the opportunity to review, comment and participate in any subsequent archaeological and ethnographic investigations undertaken before and/or during development;
5. The Department of Housing (WA), in discussion with Marapikurrinya Pty Ltd on behalf of the Kariyarra Native Title claimants, should consider initiation of an appropriate process by which the results of this survey and any subsequent archaeological surveys in the project area may be made publically available, in due course, for consideration by consultants and researchers

undertaking future archaeological studies of the Pilbara region. Such an initiative would facilitate building of the available knowledge base regarding Aboriginal occupation of north-west Australia and may result in on-going cumulative efficiencies for business and heritage-focussed research in the region;

6. If any Aboriginal objects and/or sites are identified during any proposed development, works must stop in the vicinity of the find, and the Department of Aboriginal Affairs (WA) be notified to identify the relevant legislative requirements and protocols to appropriately manage the Aboriginal objects and/or sites; and
7. If any human skeletal remains are identified during any proposed development works must stop in the vicinity of the find, and the Western Australian Police, in the first instance, should be contacted to identify the relevant legislative requirements and protocols to appropriately manage the remains.

REFERENCES

Angas, G.F. 1847 *Savage Life and Scenes in Australia and New Zealand*. London: Smith, Elder and Co., 65 Cornhill.

Anthropos Australis Pty Ltd 2008 *The Final Report of an Aboriginal Heritage Survey of the Proposed Pilbara Underground Power Project, South Hedland and Wedgefield Industrial Estate, West Pilbara Region, Western Australia*. Unpublished report prepared for Marapikurrinya Pty Ltd and Horizon Power.

Anthropos Australis Pty Ltd 2012 *The Report of an Aboriginal Ethnographic Survey and Cultural Impact Assessment of Works Proposal RGP5 Port Expansion Project, Boodarie Conveyor Corridor and Alternative Boodarie Project Areas, Port Hedland, Pilbara Region, Western Australia*. Unpublished report prepared for Marapikurrinya Pty Ltd and BHP Billiton Iron Ore Pty Ltd.

Bahn, P. (ed) 1992 *Collins Dictionary of Archaeology*. Glasgow: Harper Collins Publishers.

Battye, J.S. 1924 *Western Australia: a History from its Discovery to the Inauguration of the Commonwealth*. Oxford: Clarendon Press.

Bednarik, R. 2002 First dating of Pilbara petroglyphs. *Records of the Western Australian Museum* 20:414-429.

Brown, S. 1987 *Toward a Prehistory of the Hamersley Plateau, Northwest Australia*. Canberra: Department of Prehistory, Australian National University.

Bureau of Meteorology 2011 *Climate statistics for Australian locations - Port Hedland Airport*. Retrieved 9 April 2011 from: http://www.bom.gov.au/climate/averages/tables/cw_004032.shtml.

Burke, H. and C. Smith 2004 *The Archaeologist's Field Handbook*. Crows Nest, NSW: Allen & Unwin.

Clarkson, C. and S. O'Connor 2006 An introduction to stone artifact analysis. In J. Balme and A. Paterson (eds), *Archaeology in Practice: a student guide to archaeological analyses*, pp.159-206. Malden, USA: Blackwell Publishing.

Clement, E. 1903 Ethnographical notes on the Western Australian Aborigines. *Internationales Archiv für Ethnographie* 16(1/2):1-29.

Clune, G. and R. Harrison 2009 Coastal shell middens of the Abydos coastal plain, Western Australia. *Archaeology in Oceania* 44(Supplement):70-80.

Coldrick, B. and E.M. McDonald 2012a *Report of an Ethnographic Survey of the Mooka Camp, Proposed Western Rail Spur and Associated Borrow Pits, south of Port Hedland, Western Australia*. Unpublished report prepared for BHP Billiton Iron Ore Pty Ltd, by Ethnoscience.

Coldrick, B. and E.M. McDonald 2012b *Report of an Ethnographic Survey of the Proposed Goldsworthy Rail and Infrastructure Corridor, South Hedland, Western Australia*. Unpublished report prepared for BHP Billiton Iron Ore Pty Ltd, by Ethnoscience.

Commonwealth of Australia 2009 *Australia's bioregions* Retrieved 4 May 2009 from: <http://www.environment.gov.au/parks/nrs/science/ibra.html>.

Crabtree, D.E. 1972 *An Introduction to Flint Working*. Pocatello, Idaho.

De Gand, D. 2005 *Preliminary Advice on an Aboriginal Heritage Survey of the Finucane Island to Bing Siding (22.8km) (via Goldsworthy Junction) Rail Corridor and the BHP Billiton Iron Ore Plant in Port Hedland in the Pilbara, Western Australia*. Unpublished report prepared for BHP Billiton Iron Ore Pty Ltd

Yamatji Marlpa Barna Baba Maaja Aboriginal Corporation – The Pilbara Native Title Service, by De Gand Pty Ltd.

Department of Aboriginal Affairs (WA) (DAA) 2008 *Aboriginal Heritage: Site Avoidance Survey Brief*. Retrieved 23 August 2010 from: <http://www.dia.wa.gov.au/Documents/HeritageCulture/Resources/SiteAvoidanceSurveyBrief.doc>.

Department of Aboriginal Affairs (WA) (DAA) n.d. *Aboriginal Heritage: Site Identification Survey Brief*. Retrieved 27 August 2013 from: <http://www.daa.wa.gov.au/Documents/HeritageCulture/Resources/SiteIdentificationSurveyBrief.doc>.

Department of Indigenous Affairs (WA) 2008 *Aboriginal Heritage: Site Avoidance Survey Brief*. Retrieved 23 August 2010 from: <http://www.dia.wa.gov.au/Documents/HeritageCulture/Resources/SiteAvoidanceSurveyBrief.doc>.

Department of Sustainability Environment Water Population and Communities 2009 *Biodiversity Assessment - Pilbara*. Retrieved 16/05/2013 2013 from: <http://www.anra.gov.au/topics/vegetation/assessment/wa/ibra-pilbara.html#mammals>.

Edwards, K. and A. Murphy 2003 A preliminary report on archaeological investigations at Malea Rockshelter, Pilbara region, Western Australia. *Australian Archaeology* 56:44-46.

Engeman, R.M., K.J. Couturier, R.K. Felix Jr and M.L. Avery 2012 Feral swine disturbance at important archaeological sites. *Environmental Science and Pollution Research*.

ERIN 2005 *Interim Biogeographic Regionalisation for Australia, Version 6.1 Sub-regions*. Canberra: Commonwealth of Australia. Retrieved 4 May 2009. Available from <http://www.environment.gov.au/parks/nrs/science/pubs/map11.pdf>.

FMG 2004 *FMG Stage A Project Public Environmental Review. Section 6. Existing Environment*.

Gavin Jackson Pty Ltd and Anthropos Australis Pty Ltd 2006 *The Report on Aboriginal sites subject to a notice under section 18 of the Aboriginal Heritage Act 1972 within the Cloudbreak to Port Hedland special railway licence 'disturbance corridor', Pilbara region, Western Australia. Phases Seven to Nine*. Unpublished report prepared for Report for the Palyku Native Title Claimants, Pilbara Native Title Service & Fortescue Metals Group Pty Ltd.

Gregory, A.C. and F.T. Gregory 1884 *Journals of Australian Explorations*. Brisbane: James C. Beal, Government Printer.

Haydock, P. and D. Bunting 2006 *Preliminary Advice of an Aboriginal Heritage Survey of the Railway Corridor, from 0 KM to 178 KM Chainage and Proposed Miscellaneous Licences L45/129 to L45/136 Inclusive, Pilbara Region, Western Australia. Unpublished report prepared by Unpublished report prepared for Pilbara Native Title Service*

BHP Billiton Iron Ore Pty Ltd, by Anthropos Australis Pty Ltd.

Heritage Branch Department of Planning (NSW) 2009 *Guidelines for the Preparation of Archaeological Management Plans: State of New South Wales through the Heritage Branch of the Department of Planning.*

Hiscock, P. 1984 A preliminary report on the stone artefacts from Colless Creek Cave, northwest Queensland. *Queensland Archaeological Research* 1:120-151.

Hiscock, P. 2002 Quantifying the size of artefact assemblages. *Journal of Archaeological Science* 29(3):251-258.

Hiscock, P. and S. Mitchell 1993 *Stone Artefacts Quarries and Reduction Sites in Australia: Towards a Type Profile.* Canberra: Australian Government Publishing Service.

Holdaway, S. and N. Stern 2004 *A Record in Stone.* Melbourne, Vic: Museum Victoria and Aboriginal Studies Press.

Horton, D. (ed) 1994 *The Encyclopaedia of Aboriginal Australia: Aboriginal and Torres Strait Islander history, society and culture.* Canberra: Aboriginal Studies Press for the Australian Institute of Aboriginal and Torres Strait Islander Studies.

Hughes, P., G. Quartermaine and J. Harris 2011 Pleistocene Rockshelters J23 and J24, Mesa J, Pilbara, Western Australia. *Australian Archaeology* 73:58-61.

Iacono, N. 2006 Research in Australian historical archaeology: cutting edge or cutting corners? *Australasian Historical Archaeology* 24:77-85.

Ibbitson, S. and R. Parker 2005 *Report of an Archaeological and Ethnographic Survey of the Proposed Development of Lots 3493, 3647, 2943, 3003, 3818 and 5962 in South Hedland, Western Australia.* Unpublished report prepared for Department of Housing & Works (WA), by Australian Interaction Consultants Pty Ltd.

Jackson, G. and N. Green 2004 *Preliminary Advice of an Aboriginal heritage survey of the Kariyarra section of the proposed Port Hedland to Hope Downs railway Infrastructure corridor, borrow pits and quarries -201.0 SLK to 166.0 SLK and 154.9 SLK to 012.0 SLK, East Pilbara region, Western Australia.* Unpublished report prepared for Pilbara Native Title Service and Hope Downs Management Services Pty Ltd, November 2004, by Gavin Jackson Pty Ltd & Anthropos Australis Pty Ltd.

Jackson, G. and N. Green 2006a *The Report of an Aboriginal Heritage Survey of the Proposed Cloudbreak to Port Hedland Railway Construction Corridor, Geotechnical Locations, Water Target Locations, Wodgina Camp and Associated Access Tracks Within and North of the Kariyarra Section Woodstock/Abydos Protected Area, East Pilbara Region, Western Australia.* Unpublished report prepared for Kariyarra Native Title Claimants, Pilbara Native Title Service & Fortescue Metals Group Pty Ltd, February 2006, by Gavin Jackson Pty Ltd and Anthropos Australis Pty Ltd.

Jackson, G. and N. Green 2006b *The report of an Aboriginal heritage survey of the proposed Port Access Road and Port Access Road Facility Area, Port Hedland, Pilbara region, Western Australia*. Unpublished report prepared for Report to Kariyarra Native Title Claimants, Pilbara Native Title Service & Fortescue Metals Group Pty Ltd, October 2006.

Law, W.B., D.N. Cropper and F. Petchey 2010 Djadjiling Rockshelter: 35,000 14C Years of Aboriginal Occupation in the Pilbara, Western Australia. *Australian Archaeology* 70:68-71.

Lessa, G.C. and G. Masselink 2006 Evidence of a Mid-Holocene sea-level highstand from the sedimentary record of a macrotidal barrier and paleo-estuary system in northwestern Australia. *Journal of Coastal Research* 22:100-112.

Lourandos, H. and A. Ross 1994 The great 'intensification debate': its history and place in Australian archaeology. *Australian Archaeology* 39:54-63.

Marwick, B. 2002 *Inland Pilbara archaeology: a study of variation in Aboriginal occupation over time and space on the Hamersley Plateau*, Archaeology, University of Western Australia, Nedlands, WA.

Mattner, J. 2009 *Report on 6 Archaeological sites & Section 18 Consultations with Kariyarra representatives for railway duplication project*. Unpublished report prepared for Prepared for Prepared for BHP Billiton Iron Ore Pty Ltd. on behalf of Waru Consulting Pty Ltd.

Maynard, L. 1980 A Pleistocene date from an occupation deposit in the Pilbara region, Western Australia. *Australian Archaeology* 10:3-8.

Morse, K. 2009 Introduction: Emerging from the abyss - archaeology in the Pilbara region. *Archaeology in Oceania* 44(Supplement):1-5.

Mulvaney, J. and J. Kamminga 1999 *Prehistory of Australia*. St Leonards, NSW: Allen & Unwin.

Mulvaney, K. 2011 Iconic imagery: Pleistocene rock art development across northern Australia. *Quaternary International*:In press.

O'Connor, R. 1987 *Report of the Aboriginal Site Survey of the Proposed 66kV Powerline Route, South Hedland to Goldsworthy*. Unpublished report prepared for State Energy Commission of Western Australia, December 1987.

Public Works Department 1898 *Ashburton Harbor Works, New Jetty Contract Site Plan, PWD Construction Drawing No. 1, PWD WA 6711*. Perth: State Records of Western Australia, Public Works Department. Available.

Ryan, I. and K. Morse 2009 Towards a late holocene archaeology of the inland Pilbara. *Archaeology in Oceania* 44(Supplement):6-15.

Slack, M., M. Fillios and R. Fullagar 2009 Aboriginal settlement during the LGM at Brockman, Pilbara Region, Western Australia. *Archaeology in Oceania* 44(Supplement):32-39.

Smith, M. 1988 *The pattern and timing of prehistoric settlement in central Australia*. Unpublished PhD thesis, University of New England, Armidale, NSW.

Tille, P.J. 2006 *Soil-landscapes of Western Australia's rangelands and arid interior*, by G.o.W.A. Department of Agriculture and Food.

Troilett, G. 1982 *Report on Ethel Gorge salvage project*. Unpublished report prepared for Western Australian Department of Indigenous Affairs, Perth, WA.

Veth, P. 1989 Islands in the interior: a model for the colonization of Australia's arid zone. *Archaeology in Oceania* 24:81-92.

Veth, P. 1995 Aridity and settlement in northwest Australia. *Antiquity* 69:733-746.

Veth, P. and B. O'Brien 1986 Middens on the Abydos Plain, northwest Australia. *Australian Archaeology* 22:45-59.

Ward, I. 2004 Comparative records of occupation in the Keep River Region of the Eastern Kimberley, Northwestern Australia. *Australian Archaeology* 59:1-9.

Withnell, J.G. 1901 [1965]-a *The Customs and Traditions of the Aboriginal Natives of North Western Australia*. Adelaide, SA: Libraries Board of South Australia.

Withnell, J.G. 1901 [1965]-b *The Customs and Traditions of the Aboriginal Natives of North Western Australia* Adelaide, SA: Australiana facsimile editions, Libraries Board of South Australia.

Worms, E.A. 1954 Prehistoric Petroglyphs of the Upper Yule River, North-Western Australia. *Anthropos* 49(5/6):1067-1088.

Wyrwoll, K.H., Z. Zhu, G. Kendrick, L. Collins and A. Eisenhauer 1995 Holocene sea-level events in Western Australia: revisiting old questions *Journal of Coastal Research* 17(Special Issue):321-326.

Yokoyama, Y., K. Lambeck, P. De Deckker, P. Johnston and L.K. Fifield 2000 Timing of the Last Glacial Maximum from observed sea-level minima. *Nature* 406(6797):713-716.

APPENDIX 1 - LEGISLATIVE OBLIGATIONS

Introduction

The *Aboriginal Heritage Act 1972 (WA)* (AHA) provides statutory protection for Aboriginal sites, objects and places in Western Australia. The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Commonwealth) and the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* (Commonwealth) also provide heritage protection at a federal level. These, and other relevant statutory heritage legislation and non-statutory heritage registers, are outlined below.

Aboriginal Heritage Act 1972 (WA)

The provisions of the AHA provide blanket protection for Aboriginal objects (material evidence of indigenous occupation) and Aboriginal places (areas of cultural significance to the Aboriginal community).

The following sections of the AHA are relevant to the investigation described in this report:

Section 5 states that:

This Act applies to —

(a) *any place of importance and significance where persons of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of the Aboriginal people, past or present;*

(b) *any sacred, ritual or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;*

(c) *any place which, in the opinion of the Committee, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State;*

(d) *any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed.*

Section 15 states that anyone who discovers an Aboriginal object is obliged to report the discovery to the Registrar of Aboriginal Sites.

Section 17 states that it is an offence to excavate, destroy, damage, conceal or in any way alter any Aboriginal site and it is an offence to in any way alter, damage, remove, destroy, conceal, or deal with in a manner not sanctioned by relevant custom, or assume the possession, custody or control of, any object on or under an Aboriginal site without consent from the Minister for Indigenous Affairs under Section 16 or Section 18 of the AHA.

Section 19 makes provision for protection of 'Protected Areas' or locations of special significance to Aboriginal culture.

Heritage Act of Western Australia 1990

The *Heritage Act of Western Australia 1990* (Heritage Act) provides statutory protection for non-Aboriginal places that are listed on the State Register of Heritage Places. In order to be listed, Section 47 (1) (a) states that a place:

- (i) *is of cultural heritage significance; or*
- (ii) *possesses special interest related to or associated with the cultural heritage, and is of value for the present community and future generations.*

A place is defined as (Section 3):

an area of land sufficiently identified by survey, description or otherwise as to be readily ascertainable, and includes —

- (a) *an area of land situate below low water mark on the sea shore or on the bank of tidal waters, or in the bed of any watercourse, lake or estuary;*
- (b) *any works or buildings situated there, their contents relevant to the purposes of this Act and such of their immediate surroundings as may be required for the purposes of the conservation of those works or buildings; and*
- (c) *as much of the land beneath the place as is required for the purposes of its conservation;*

A place can include, but is not limited to, buildings, structures, gardens, cemeteries, landscapes and archaeological sites (HCWA 2010).

Under Section 79 (1) of the Heritage Act:

Subject to subsection (2), where any place is entered in the Register, a person who —

- (a) *damages or despoils that place or any part of, or thing in, that place; or*
- (b) *removes anything from that place,*

or who authorises, causes or permits any other person to do any of those things, otherwise than in the course of works of the kind referred to in section 63 or which are authorised by a decision-making authority pursuant to this Act, commits an offence.

Penalty: \$5,000.

Daily penalty: \$500.

- 1) A person may, on payment of the prescribed fee, make application to the Council in writing for a permit authorising the doing of anything that might otherwise contravene subsection (1) but would not contravene any applicable Conservation Order.

It is worth noting that although a site may not be listed for its archaeological values, the Heritage Act still applies to any archaeological material on the site.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)

The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth) was enacted at a federal level to preserve and protect areas (particularly sacred sites) and objects of particular significance to Aboriginal Australians from damage or desecration. Steps necessary for the protection of a threatened place are outlined in a gazetted Ministerial Declaration (Sections 9 and 10). This can include the prevention of development.

As well as providing protection to areas, it can also protect objects by Declaration, in particular Aboriginal skeletal remains (Section 12). Although this is a federal act, it can be invoked if a state is unwilling or unable to provide protection for such sites or objects.

Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 (Commonwealth) provides protection for natural and cultural heritage places at a Federal level. The EPBC Act deals with four heritage lists: the World Heritage List, and the National Heritage, Commonwealth and Overseas Places of Historic Significance to Australia lists. World heritage items are those protected through the EPBC Act, for their outstanding international heritage values. National heritage items are assessed as having natural or cultural significance at a national level. The World and National lists may include items on private or state crown land. The Commonwealth list only includes items on land owned or leased or occupied by the Commonwealth.

Items on the registers described above are protected under the terms of the EPBC Act. The EPBC Act requires approval before any action takes place which has, will have, or is likely to have, a significant impact on the heritage values of a listed place. Proposals for actions which could affect such values are rigorously assessed. The EPBC Act is administered by the Australian Heritage Council.

Local Government Inventories

Commonly known as Municipal Inventories, Local Government Inventories are lists of items of cultural heritage value compiled and maintained by local governments, as required under Heritage Act of Western Australia 1990. Items listed on Local Government Inventories are not protected unless they are linked to a town planning scheme. These vary between local governments; therefore the implications for the protection of heritage on any given site need to be determined on a case-by-case basis.

Non Statutory Heritage Registers

Register of the National Estate

The Register of the National Estate (RNE) is now a non-statutory list of places of natural and cultural heritage value. There are no statutory approvals or reporting requirements for sites included on the RNE except in certain instances that affect Commonwealth owned land only.

National Trust of Australia

The National Trust of Australia (NT) maintains a register of places it has classified as having cultural significance and are worthy of conservation.

The register does not have any statutory power but classification of an item or place on the register is considered an authoritative statement of the cultural significance of the place. The NT maintains the register as an advisory and educative tool.

APPENDIX 2 - ABORIGINAL SITE TYPES

Definitions

Archaeological Site Types

The potential for survival of any archaeological material will depend on the degree of disturbance from natural and anthropogenic processes. Areas of intact original soils have potential to contain undisturbed archaeological material, whereas areas that have been heavily disturbed by natural (e.g. flooding, animals) or anthropogenic modification of the landscape have less potential.

As defined by the Department of Aboriginal Affairs (WA) (DAA), a diverse range of places can comprise Aboriginal sites. They fall into two basic overlapping categories: archaeological or anthropological sites. The following outlines the major types of Aboriginal archaeological sites presented alphabetically. The definitions are based on those provided by the DAA (DIA 2010b).

DAA Site Types

Artefact (Artefact Scatters)

An artefact site is a place where human activity is identifiable by the presence of a portable object(s) (e.g., stone, glass, bone, shell) utilised or modified by Aboriginal people in relation to traditional cultural life past or present.

Also referred to as open artefact scatters, they can occur almost anywhere that Aboriginal people travelled in the past. However, rather than being haphazard, it is likely that people moved preferentially along in relation to certain types of landform features particularly those associated with water. The cultural activity represented by these sites may be associated with hunting or gathering activities, domestic camps, or the manufacture and maintenance of stone tools. The density of artefacts present in these scatters can vary dramatically and may relate to either transient or short stay camps, or base camps of long term and/or repeated occupation. These types of sites are commonly referred to as 'open campsites'.

Engravings

Engravings, also known as petroglyphs, are motifs (either figurative or non-figurative) on a rock surface produced by percussion or abrasion (i.e. subtractive process).

Rock engravings, or petroglyphs, are found on areas of exposed rock outcrops and less commonly within rock shelters. Engravings are produced by percussion or abrasion (DIA 2010b). A wide range of motifs has been reported, including anthropomorphs, equipment and weapons, animals, footprints and ceremonial engravings. Also see Painting.

Fish Traps

Fish traps are a stone, wood or other similar structure used to catch fish. They are found in any type of watercourse (e.g. lakes and rivers), and along the coast.

Grinding Patches/Grooves

Grinding patches are rock pavements or slabs worn smooth through grinding. Proximity to water may be a defining feature, such that grinding areas closely linked to gnamma holes, water holding depressions or other water sources are more likely to be indicative of wet milling of foodstuffs (especially grass seeds), ochre or other commodities. Those occurring at some distance from a water source may indicate where edged implements were shaped and sharpened in the past.

Grinding grooves are found within areas of exposed flat-bedded rock (non-portable), particularly along or adjacent to water courses. Grinding grooves represent locations where ground edged implements were shaped and sharpened in the past. The grooves are often shallow and elliptical in shape. They are often close to water courses because running water was used in the grinding process.

Webb (2007: 123) notes that flat grinding patches and grinding grooves probably represent opposing ends of a continuous sequence of grindstone development, rather than being discrete types.

Grindstones found separately to grinding patches or grooves are be considered under the site type Artefact, described above (DIA 2010b).

Historical

A historical site is a place that has historical associations with Aboriginal people. It may or may not contain physical evidence of those associations.

Human-made structure

Human-made structures consist of the placement or arrangement, by Aboriginal people, of stone, wood or other material made into a structure for ceremonial or utilitarian purposes (DIA 2010b).

The most common type of structure in the archaeological record is stone arrangements. The latter may be single standing stones or a cluster of stones, which may have contemporary ceremonial and/or mythological significance.

Midden

A shell midden is a deposit containing shells that may occur in the open or in caves or rock shelters, usually near a beach, estuary, rocky shoreline, inland lake or river. They can appear as large mounds as a buried deposit or may only be a surface scatter (Bowdler 2006: 316).

Middens are the result of the exploitation of a mollusc resource by Aboriginal people and usually also contain artefacts, fireplaces, burnt shell and bones (DIA 2010b). Natural shell beds and shell accumulations by other species appear very similar to shell middens, therefore in order to determine that a collection of shells is a midden rather than a natural shell bed the DAA guidelines (2010b) stipulate that middens must fulfil at least two of the following criteria. Middens must:

- Contain charcoal, burnt wood, blackened shells, and hearths;
- Contain bones of other edible species;
- Contain artefactual material;
- Contain layers indicating cultural rather than natural deposition. That is middens are usually unstratified or roughly stratified, whereas natural shell beds are generally well-stratified and show evidence of water-laid deposits (Bowdler 2006: 319);
- Contain evidence that the shell fish have been exploited by human beings, e.g. broken open backs, edible size;
- Contain demonstrable selection of edible, mature, shell fish species; and
- Have ethnographic and/or historical evidence related to the accumulated shell refuse.

Shell middens in the Pilbara region are dominated by *Anadara granosa* (blood cockle). The species first appears in the archaeological record of the Pilbara at around 5300 BP and continues in middens until some time in the twentieth century (Clune and Harrison 2009: 70; Harrison 2009: 96).

Three types of midden have been identified. First, dinner-time camps, which are often located adjacent to shell beds on high, flat ground. They can be used once or repeatedly and were mainly used by women. Second are home bases, which are usually an evening camp away from the source, and are visited more regularly by both men and women. Finally are processing sites, normally located

adjacent to the shell bed, where the meat is removed and taken to the home base (Meehan 1982; cited in Clune and Harrison 2009: 73).

Shell middens provide important information about diet and the use of resources, and can be used to date occupation of the area.

Modified or Scarred Trees

A modified tree is one that has been modified by Aboriginal people by removing the bark or wood resulting in the formation of a scar. This sort of modification was and is frequently done for the making of implements, tools or other materials that were used in traditional cultural practices (DIA 2010b).

Following the DAA guidelines (2010b), a modified tree must fulfil two or more of the following criteria:

- Be an indigenous species and a mature individual;
- The scar base begins above ground level;
- The scar is roughly parallel-sided and fairly symmetrical in its overall shape;
- The bark regrowth is generally regular;
- The scar terminations are either squared off or pointed as a result of bark regrowth;
- Axe marks are present; or
- Suspected toe holes are arranged in a usable pattern.

Painting

Paintings, also known as pictographs, are motifs (figurative or non-figurative) or markings on surfaces such as rocks, rock walls and trees at fixed locations that are produced by adding pigments and or mediums, such as ochre, blood, beeswax, animal fats, vegetable dyes, tree saps (i.e. additive process). Also see Engraving.

Quarry

A quarry is a place where stone or ochre has been extracted. Following the DAA site definition (Department of Indigenous Affairs (WA) 2010b), at least two of the following pieces of evidence are required to establish that a natural occurrence of raw material has been used as a quarry:

- Evidence for the removal of material/modified surfaces in the form of negative scarring, crushing, areas of excavation etc.;
- Presence of implements used during extraction (e.g. hammer stones, fire-hardened sticks) at the source;
- Evidence of flaking and reduction of the stone material at the source;
- Presence of partially-worked material at the source; and
- Ethnographic evidence relating to the extraction of raw material at the source.

Repository/Cache

A place where cultural or utilitarian objects are/were taken, or stored, by Aboriginal people, either past or present.

Rock Art

Rock art refers to art undertaken on a rock surface. Rock art types can include paintings, drawings, abrading or engravings. Rock art painting and drawing sites usually occur in rock shelters which offer a degree of protection from the weather, while abrading and engravings are often found in the open.

Skeletal Material/Burial

These sites can occur anywhere in the landscape and in many cases are parts of burial complexes. A number of burial methods were used by Aboriginal groups including cremation, exposure, stretched burial inhumation and flexed burial inhumation. Burials are often found within sandy or loose soils. They may be marked by stones or may have no recognisable features at all. According to the DAA (2010), at least one of the following pieces of evidence is required to establish that the reported place is of Aboriginal origin:

- Aboriginal skeletal material is visible.
- Aboriginal mortuary/burial markers and or ethnographic evidence about the burial/skeletal material.

Additional Information Supporting Site Types

Archaeological Deposit

An accumulation of cultural material and sediment deposited over time.

Birthplace

A place at which an Aboriginal person was born and is significant based on tradition, historical association or Aboriginal sentiment.

Camping Place

A place at which Aboriginal people have camped in association with traditional cultural life past or present.

Hunting Place

A place where Aboriginal people have hunted in association with traditional cultural life past or present.

Massacre

A place where a significant conflict occurred between Aboriginal and non-Aboriginal groups which resulted in the deaths of numerous Aboriginal people.

Meeting Place

An area that was traditionally used by Aboriginal people as a gathering and meeting ground.

Mission

A place established by missionaries to convert Aboriginal people to Christianity. Such places typically assimilated residents by training and indoctrination.

Named Place

A place that has a traditional Aboriginal name.

Ochre

A mineral pigment used by Aboriginal people for painting and ceremonial purposes.

Plant Resource

A source of plant material used by Aboriginal people for a variety of functions such as food and medicine.

Rock shelter

Rock shelters are found within areas of outcropping rock, particularly within valley escarpments where the rock often forms into overhangs. Early European settlers on the east coast of Australia observed that rock overhangs were favoured places for Aboriginal camping, as they formed ready-made shelters. Rock shelters often contain a range of archaeological evidence associated with many aspects of domestic, economic and spiritual life. Artworks in the form of engravings, paintings, drawings or stencils can be found on the ceilings and walls. Stone artefact deposits representing manufacture, maintenance and/or use of tools are found within and adjacent to shelter sites. Remnant hearths representing former campfires and cooking fires are also found within rock shelter deposits. Less commonly, human burials may be found within shelter sites.

There are a number of criteria that are considered when identifying whether a given rock shelter was used by Aboriginal people. These are:

Evidence of human occupation in the form of:

- Artefacts;
- Engravings and/or paintings on the ceilings and walls;
- Grinding patches or grooves;
- Quarrying in or around the rock shelter;
- Butchered bone or other evidence of food processing. E.g. shell, emu eggs etc.;
- Manuports;
- Remains of hearths, campfires and cooking fires evidenced by charcoal, ash, burnt bone or stone with evidence of heat stress and scorching;
- Smoke staining on walls or roof (NB. fire may not necessarily be caused by campfires or anthropogenic actions);
- Burials;
- Size: sufficient for occupation;
- Location: safe and sheltered with a view of surrounding area (Burke and Smith 2004: 221);
- Presence of floor deposit: deeper deposits have a greater potential for more artefactual material, however artefacts may be present in any floor deposit;
- Relatively flat floor;
- Aspect: some studies suggest that rock shelters in the Pilbara region tend to have an easterly aspect, ranging from the south to the north-east (Public Works Department n.d.: 55; 1898a);
- Minimal disturbance to shelter, such as water scouring;
- Nearby water source; and
- Occupation of other rock shelters in vicinity.

Shell

A place with fragments of entire examples of molluscan shell material, appearing as a surface scatter or an isolated find. The place may represent either a natural deposit, relocated fill or the remains of a mealtime camp by Aboriginal people (also see Midden).

Water source

A source of water, (e.g., gnamma holes, soaks, springs, rock holes), with ethnographic evidence of its use or modification for use by Aboriginal people in connection with traditional cultural life past or present.

Isolated Finds

Isolated finds occur anywhere in the landscape and may represent the random loss, deliberate discard or abandonment of artefacts, or the remains of dispersed artefact scatters. Note that isolated finds are not considered a site type by the DAA, but are worth noting as their presence demonstrates that Aboriginal people were in an area, and may indicate other archaeological material nearby.

Potential Archaeological Deposit

Potential Archaeological Deposit (PAD) is a term used to describe areas that have the potential for archaeological material to be below the surface, but do not have any evidence of occupation. In a Western Australian context, PADs are most commonly identified in rock shelters which fulfil most of the other criteria for identifying a rock shelter that had been occupied by humans, listed above, but have no artefactual material.

APPENDIX 3 - STONE ARTEFACTS

Stone Artefacts

Definition

Stone artefacts are defined as 'any piece of rock modified by human behaviour, whether intentionally or unintentionally' (Clarkson and O'Connor 2006: 160). Pieces that have been intentionally modified are referred to as flaked artefacts, and they have a number of characteristics, which indicate the application of an external force to a core (Hiscock 1984: 129). These include:

- A positive or negative ring crack;
- A distinct positive or negative bulb of force;
- A definite erailure scar in an appropriate position beneath a platform; and
- Definite remnants of flake scars (e.g. dorsal scars and ridges) (Hiscock 1984: 128).

Objects that have one or more of these characteristics are called artefacts (Hiscock 1984: 128).

Artefact types

Types of artefacts identified during the current survey work were:

- Flakes: pieces of rock that have been struck off a core (Hiscock 1984: 129);
- Cores: pieces of stone that have one or more negative flake scars, but no positive flake scars (Hiscock 1984: 129). These are classed as either single platform (SPC) (i.e. only on surface has been struck to produce flakes) or multi-platform (MPC) (more than one surface was struck to produce flakes);
- Core fragments: cores that have only the distal portion of negative flake scars and no point of impact;
- Retouched flakes: flakes that have had flakes removed (Hiscock 1984: 129);
- Manuports: pieces of stone that are obviously not found in the immediate area, and therefore must have been brought in by people (Burke and Smith 2004: 212)
- Millstones: large flat pieces of stone that are moveable, and have one or two long shallow grooves that are worn through the process of abrasion (Public Works Department 1898: 32);
- Mullers: triangular or oval shaped hand-sized pebbles or rocks with a grinding area on one or both end surfaces (Public Works Department 1898: 33);
- Hammerstones: a hard stone used to strike a core, producing a flake (Holdaway and Stern 2004: 4); and
- Debris (also referred to as flaked pieces): chipped artefacts that cannot be identified as either a flake, core or retouched flake (Hiscock 1984: 129).

Flakes were divided into five categories – complete flakes, longitudinal, transverse, marginal and surface fragments (Hiscock 2002: 252-253). Complete flakes have the initiation of fracture, the entire termination of fracture and most of the lateral margins. Longitudinal fragments are flakes that have broken along the length of the percussion axis, through the bulb of percussion. They contain a portion of the platform, and the termination. This damage usually occurs during manufacture (Holdaway and Stern 2004: 113).

Transverse fragments have the lateral margins, but do not have either the initiation of fracture or the termination. This damage is often caused by trampling, either by people or animals (Burke and Smith 2004: 215; Holdaway and Stern 2004: 113; Angas 1847: 89). Proximal fragments have the initiation fracture, distal fragments have the termination and medial fragments have neither the initiation or the termination fractures (Hiscock 2002: 252-253).

Marginal fragments have portions of one lateral margin, but do not contain the fracture initiation, termination or portions of the second lateral margin, and surface fragments have a portion of the ventral or dorsal surface, but none of the initiation, termination fractures, nor the lateral margins (Hiscock 2002: 253).

The attributes recorded for each flake were:

- Oriented length: measured perpendicular to the striking platform from the point of force (where the artefact was struck) to the termination;
- Oriented width: measured between the two flake margins, 90° to the maximum length at the mid-point of the length;
- Oriented thickness: measured between the dorsal and ventral surfaces at 90° to the oriented length and width at the mid-point of the length; and
- Platform length and thickness.

Oriented dimensions were also measured on single platform cores. For flake fragments, multi-platform cores, debris and grinding material, the maximum dimensions were measured.

Tool types

Flakes that have been worked further, following their removal from the core, are referred to as tools. Such artefacts were usually made for a specific purpose. They are characterised, based on common features, for example Kimberley points and blades.

In this report, a blade is defined as a flake that is twice as long as it is wide and has parallel edges (Holdaway and Stern 2004: 16).

Cortex and Core Reduction

The cortex is the weathered exterior of the parent rock. It is analysed to determine where in the sequence a flake was removed from its source. This is divided into three categories (Burke and Smith 2004: 213, 216):

- *Primary*: where the flake was one of the first to be removed, and thus its dorsal surface is 100% cortex;
- *Secondary*: where the flake was not one of the first to be removed, but was removed early in the sequence. The flake will have some cortex and some flake scars; and
- *Tertiary*: the flake was removed in the last stages of the manufacturing process, and has no cortex.

The extent of flake reduction is measured by the number of negative flake scars on the dorsal surface of the flake. This allows an estimation of the amount of time and energy invested in producing the artefact (Clarkson and O'Connor 2006: 183). By comparing the termination, dimensions, overhang removal (see Platform Type, below for a definition of overhang removal), and number and shape of negative flake scars, it can be determined at what stage in the reduction sequence a particular artefact was manufactured (Clarkson and O'Connor 2006: 189).

Clarkson and O'Connor (2006: 187-189) have identified nine stages of flake reduction. Of these, Stages 1 and 2 have primary cortex, Stage 3 has secondary cortex and Stage 4 has tertiary cortex. Stages 5-8 are a repeat of Stages 1-4, on the same core, re-using the original platform. Stage 9 is the third or greater rotation of the same core, and the resulting flakes have no cortex on their surfaces.

There are numerous terms for the type of cortex, and whether it is the result of land-based weathering, or is water-rolled (Burke and Smith 2004: 213), thus indicating the source of the rock. Here they are referred to as terrestrial and riverine, respectively.

Platform Type

Platforms are divided into different types, which give information about how and when in the sequence of reduction of a core, a flake was manufactured. The types used here are (after Holdaway and Stern 2004: 119-120):

- Cortical: platform consists of cortex and no flake scars;
- Flat: cortex has been removed and platform consists of one flake scar;
- Faceted: cortex has been removed and platform consists of two or more flake scars;
- Crushed: platform is damaged such that platform cannot be distinguished; and
- Focused: platform is very small and point of impact is focused on one area, such that it cannot be determined whether the platform was cortical or flaked.

Additional notes were made regarding whether or not there was overhang removal, indicating core preparation, or gull wings. Overhang removal is identified through the presence of small scars along the dorsal surface of the platform, and this indicates where the knapper removed the lip left by previous flake removals (Holdaway and Stern 2004: 143). Gull wings are used to describe the shape of the platform (which looks like a stylised drawing of a bird) and indicate that many flakes have been removed from the core, leaving a very thin platform.

Material Source

The cortex also provides information about the type of stone sources used (i.e. a primary or secondary source). Artefacts with a rind or rough cortex were acquired from a primary source (or an in situ outcrop). Artefacts with a smooth or water-rolled cortex originate from a secondary source (e.g. a river cobble from a waterway). The amount of cortex on an artefact has the potential to reflect the distance artefacts were transported from the source (Hiscock and Mitchell 1993: 12-17). A high percentage of cortex on an artefact indicates that the source of stone was nearby, while artefacts with less cortex or no cortex were probably transported further from the source. Equally, as cores are transported away from the source they are typically highly reduced and the resulting flakes are also smaller.

Termination

The different flake termination types used here are:

- *Feathered*: often very sharp, as the flake gradually reduces to a very fine thickness before the force exits the core and removes the flake;
- *Hinged*: the result of the force rolling away from the core, resulting in a rounded distal end;
- *Stepped*: result when a flake prematurely breaks or snaps during removal, leaving a distal end that is often squared off; and
- *Plunging*: the result of the force rolling back towards the core and often taking off its "bottom".

Hinge, step, and plunging terminations are often seen as "errors," and certainly they sometimes were, but they also may be deliberately produced.

Heat Fracturing

Heat fracturing occurs when pieces of stone break off as a result of excessive heating, and differential expansion and contraction of the rock. When the heating is excessive, this can be seen in the form of pot lids, which are plano-convex flakes that leave a concave scar (Crabtree 1972: 49; Angas 1847). Heat fracturing can also produce what appear to be flake scars, however they can be differentiated from human-made flakes as the point of impact comes from within the rock, not from an edge, or platform. The presence of heat fracturing is noted as it indicates heating of the material, and can be misinterpreted as the result of human activity.