Appendix L

Report on Archaeology and Historic Heritage
prepared by Begnaze Pty Ltd



Environmental Impact Statement for the proposed Trans Territory Underground Gas Pipeline

Report on Archaeology and Historic Heritage

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Environmental Impact Statement for proposed Trans Territory Above Ground Gas Pipeline

Archaeology and Historic Heritage

Prepared for: Alcan Engineering Pty Ltd and Woodside Energy Ltd

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EXECUTIVE SUMMARY

The consultant was engaged by EcOz Environmental Services to identify and record any archaeological and historic sites that may be impacted upon by the construction of the proposed Trans Territory Pipeline to be located between the Blacktip Gas Plant near Wadeye and the Gove Peninsula, Northern Territory. Recommendations were made in the field to realign the pipeline around identified archaeological sites. The report includes a description of the findings, and recommendations are made for the mitigation of disturbances any archaeological or historic sites that may be disturbed during the design, construction and operational phases of the project.

Background research was carried out to find any previously recorded archaeological and heritage sites in the area of the proposed development. Two field surveys were carried out, one in late 2003 and the other in the middle of 2004. The surveys consisted of vehicle transects as near as possible to the proposed pipeline alignment and regular pedestrian transects, both random and purposive were made along the proposed route.

Thirty four archaeological sites, six historic sites and 84 background scatters were located during the survey. Of these, twelve sites and 47 background scatters are located within 100 metres of the centre line of the proposed pipeline route revision 7 and may be disturbed during the construction of the pipeline. At this stage of the project, only two specific recommendations have been made, one for the Northern Australian Railway, and one for the 47 background scatters. This was necessary as the exact location of the other sites and the pipeline alignment is not known. It is anticipated that detailed recommendations for specific sites will be made after the survey teams have pegged the exact route.

There are two recommendations for ensuring the protection of unidentified archaeological material located before and during the construction stage of the pipeline. Firstly an archaeologist should be present during the flagging of the majority of the pipeline alignment. Secondly it is possible that during the construction stage subsurface archaeological material may be located. It is recommended that response mechanisms are set up to ensure that this material is protected.

During the operational stage it is recommended that the exact location of sites are not revealed to anyone who will be working along the pipeline alignment as some sites may be particularly sensitive to constant visits.

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1. INTRODUCTION

This report was prepared for Alcan Engineering Pty Ltd and Woodside Energy Ltd to describe the archaeological component of an environmental assessment for the proposed Trans Territory Pipeline Gas Development (TTP) that traverses the Northern Territory from the proposed Blacktip Gas Plant near Wadeye on the west coast to the Gove Peninsula on the north east coast, a distance of approximately 940 kilometres. Begnaze was contracted to carry out the archaeological surveys by EcOz Environmental Services.

As part of the environmental assessment a preliminary survey was carried out to define a suitable 100 metre wide pipeline corridor route in which the 30 metre pipeline alignment could be located. Included in the report are the findings of the archaeological surveys made in 2003 and 2004 over the above area, and the assessment of the archaeological or historic significance of sites or objects that may be impacted upon by the development. Recommendations are then made to mitigate the loss of any archaeological or historic material.

To ensure that archaeological and historic sites and objects are not damaged or destroyed during the proposed development and are protected within the terms of the *NT Heritage Conservation Act 1991*, the aims of the archaeological and cultural heritage project are:

1. To locate and record archaeological and historic objects or places.
2. To assess the nature, distribution and cultural significance of the materials within a regional, Territory and national context.
3. To provide recommendations for the management of particular archaeological or historic places or objects.
4. To provide recommendations for generalised mitigation procedures and management of prescribed archaeological places and objects.
5. To carry out mitigation and conservation strategies designed to minimise loss of heritage values to the Northern Territory.

The scope of works (see Section 5 – Methodology) for the archaeological and historic heritage divided the archaeological assessment into four stages. The requirements of field work in 2003 and 2004 made it necessary for an archaeologist to be present during the initial survey of the pipeline alignment, and so some of the components in the different stages have merged into other stages.

The aim for the 2003-4 survey team was to identify a 100 metres wide pipeline alignment within the already identified 10 kilometres wide corridor. Consequently the area surveyed by the archaeological team was not necessarily the precise 30 metre wide pipeline alignment. The archaeological team influenced the selection of the 30 metre corridor, but variations to the selected route may reveal archaeological material not found by the archaeological team.

2. HERITAGE LEGISLATIVE FRAMEWORK

2.1. Northern Territory legislation

There are two kinds of heritage sites protected under the *NT Heritage Conservation Act (1991),* declared and prescribed places and objects. The Act places legal constraints on owners of private property, local government and the Crown:

- places or objects listed on the Northern Territory Heritage Register are declared heritage places and objects that are protected under section 33 of the Act, and
- prescribed archaeological places and objects, which may or may not be declared, are protected under sections 29 and 39 of the Act.

It is an offence under the Act to damage, destroy, alter or carry out work of any sort on declared or prescribed sites without the written consent of the Minister or Minister's delegate.

2.1.1. Declared heritage places and objects.

To date there have been more than three hundred nominations to the Northern Territory Heritage Register, leading to the registration of more than 150 places. Categories, which describe the status of each site on the Northern Territory Heritage Register database, are listed in Table 2.1.

Table 2.1. Site status on the Northern Territory Heritage Register database.

Status	Description
D	Declared heritage place.
NR	Not recommended. HAC* determined that the place did not meet heritage assessment criteria and did not hold sufficient value to warrant declaration under the act.
RF	Refused by the Minister. HAC* recommended for declaration and minister refused to do so.
P	Proposed. HAC* has determined that the place warrants declaration under the Act but has not yet made its recommendations to the minister.
RV	Revoked. Declaration as a heritage place pursuant to Section 26(1) of the Act is revoked.
N	Nominated. HAC* has yet to complete its assessment of the heritage value of the place.

*Heritage Advisory Council

The Northern Territory Heritage Register contains places that possess special significance for the Northern Territory and have been recognized for a wide range of natural and cultural values. As a result it includes places that have been deemed significant because of their environmental and /or cultural characteristics. For the purposes of the current report, only places of historic or archaeological significance have been included.

2.1.2. Prescribed archaeological places and objects.

Most archaeological places and objects are listed in the Heritage Conservation Regulations (1999) as prescribed places and objects. The NT Heritage Conservation Services, Department of Infrastructure Planning and Environment (DIPE) holds the Archaeological Sites Register. Listing on this register does not necessarily mean that a site is protected or holds legal significance under the *NT Heritage Conservation Act 1991*. Included in this register are the protected prescribed sites that consist of all archaeological sites and objects pertaining to the past occupation by Aboriginal or Macassan people.

2.2. Commonwealth legislation

The Commonwealth Government protects heritage sites under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environment and Heritage Legislation Amendment Act (No 1) 2003* and places legal constraints on archaeological and historic sites. There are two lists of protected heritage sites that may be relevant to this study. The lists are available on the internet at http://www.deh.gov.au and they are:

- *The Register of the National Estate* which consists of "…an inventory of places in Australia with aesthetic, historic, scientific, or social significance or other special value for present and future generations" (Pearson and Sullivan 1995:45). It represents a national database of places with significant Aboriginal, historic or environmental values.

- *The National Heritage List* that protects places of exceptional natural and cultural significance with penalties for any breaches. Approval by the Minister of Environment and Heritage is needed before any sites are disturbed.

2.2.1. Register of the National Estate

The Register of the National Estate database contains not only places that are registered but also places that have been nominated to the register and are yet to be assessed, as well as nominated places that have been rejected or removed from the Register of the National Estate (Table 2.2.). Sites are divided into places of historic, Aboriginal or environmental significance. A total of 290 places of historic significance are listed on the Register of the National Estate database for the Northern Territory, of which approximately 150 are registered (October 2004). The entry of a place on the Register of the National Estate does not place any direct legal constraints or control over the actions of state or local government or private owners, but does impose other legal obligations.

Table 2.2. Site status on the Register of the National Estate database.

Status	Description
R	*Registered.* The place is listed on the Register of the National Estate.
ID	*Identified.* The Commission has formally considered the values of this place and decided that it should be publicly proposed for entry in the Register. The place is awaiting publication in the gazette and the press to give full effect to this decision.
RE	Removed from the Register or Interim List. The place has been removed from the Register or list via a public process that provides for the submission of objections.
IL	*Interim list.* The place has been publicly proposed for entry in the Register and the AHC may be awaiting objections, considering objections, or seeking other data before making a decision on whether the place should be entered on the Register proper.
IP	*Indicative place.* Data provided to or obtained by the Commission has been entered into the database and the place is at some stage in the assessment process. The AHC has not made a decision on whether the place should be entered into the Register.
D	*Destroyed*. The place has been destroyed before being assessed or listed.
REJ	*Rejected*. The AHC has assessed the place and found that it does not warrant entry in the Register in its own right.

While the database is large, relatively comprehensive and national in focus, individual site listings vary enormously in terms of the amount and the accuracy of information contained within them. Some site listings contain no information other than a site name and approximate location, while other listings contain inaccurate information or represent duplicate listings. Only places of historic or archaeological significance have been included in this current report.

2.2.2. National Heritage List

This list commenced on 1st January 2004, and as at October 2004 there were only three heritage or Indigenous sites recorded for the Northern Territory (being Kakadu National Park, Uluru-Katatjuta National Park and the Hermannsburg historic precinct). This will probably change as the Australian Heritage Council enters more sites onto the list.

3. ENVIRONMENTAL SETTING

As the proposed pipeline crosses many types of terrains, the environmental background data has been divided into four sections that correspond to the four land system surveys that have been documented over the area that the pipeline alignment traverses. These districts consist of the Ord-Victoria (Stewart *et al*. 1970), Tipperary (Speck *et al*. 1961), Roper (Aldrich and Wilson 1992), and Arnhem Land (Lynch and Wilson 1998). Below are the boundaries between the four regions used for this report and the distances given along the pipeline are measured from the proposed Blacktip processing plant near Wadeye.

- Ord-Victoria and Tipperary. The boundary is at Bradshaw Creek near Dorisvale Station and 230 kilometres from the starting point. Length of proposed pipeline over the Ord-Victoria region is 229 kilometres

- Tipperary and Roper. The boundary is at the Stuart Highway and 362 kms from the starting point. Length of the proposed pipeline over the Tipperary region is 131 kilometres.

- Roper and Arnhem Land. The boundary is at the boundary between the Mainoru Pastoral Lease and the Arnhem Land Aboriginal Land Trust River and 577 kms from the starting point. The length of the proposed pipeline over the Roper region is 215 kilometres and over the Arnhem Land region is 353 kilometres.

The pipeline transects the Northern Territory in an east west direction between the latitudes of 14.65^0S and 12.15^0S. This area is part of what is generally described as the Top End. The region experiences two main seasons, the wet season between November and April with the majority of rain coming from monsoons from the north or local storms, and the dry season between May and October. The average rainfall from the east to west coast of the Top End varies between 950mm to 2100 mm per year.

The following sections describe in more detail the four regions over which the pipeline is located. In all four regions the pipeline alignment crosses major rivers, some of which may only consist of a series of waterholes in the dry season and many ephemeral creeks and watercourses.

3.1. The Ord – Victoria Region

The proposed pipeline alignment crosses one larger river, the Moyle, ephemeral creeks and swampy ground adjacent to creeks in the Ord-Victoria region (Stewart *et al*.1970, Morgan 1972). From the Blacktip area the alignment crosses broad coastal plains of the Cambridge Gulf Lowlands that contain deep deposits of soil and alluvium, a few low hills, a number of residuals rising over 300 metres in some places, and broad shallow depressions and widely spaced streamlines. The gently undulating plains overlie sandstone, shale and limestone, and there are gravely soils on the steep low hills The *Eucalypt* woodland has an understorey of grass and sometimes palms.

The area around the Moyle River consists of many braided streams, gently sloping or undulating plains with yellow soils and grasslands, open woodland and shrub land. To the east of the Moyle River the pipeline crosses steep high slopes and rugged ridges of sandstone and siltstone rock until it reaches the plateau on top of the Wingate Ranges. The majority of the plateau belongs to the Wingate Land System and consists of gently undulating lateritic plains, with some lateritic outcrop covered in tall open forest with shallow residual soils and alluvium on fine sandstone, shale and mudstone. There are smaller areas of the Pinkerton Land System where there are stony plains, sandstone outcrops and low open forests.

3.1.1. Environmental factors affecting the archaeological visibility.

It is highly unlikely that any archaeological material will be found on the surface of the approximately 70 kilometres of deep alluvium plains between the coast and the Wingate Ranges. Any stone artefacts discarded in the past in this area would be quickly covered by the soils deposited during the annual wet season floods. This process could also be occurring along creeks where there is usually a high potential for locating stone artefacts in areas where the surface has been eroded away. There will be more potential for locating artefacts on the gravely surfaces of the low hills.

There is a higher probability for locating archaeological material along the edges of the Wingate Ranges and along the creeks on the plateau where the surfaces are disturbed by erosion during the wet season. The edges of the escarpments may also be suitable locations for rock shelters which were used as both camps sites and ceremonial sites in the past.

Another area where archaeological material may not be identified is between KP 140 and KP200 on the Wingate Ranges. This section of the route consists of undulating plains with very few creeks that would contain water only in the wet season. Therefore it unlikely that there will be many signs of past Aboriginal occupation in an area where water was not relatively close and readily available.

3.2. Tipperary Region

The pipeline enters the Tipperary region at Bradshaw Creek near Dorisvale Station homestead and exits the region at the Stuart Highway just north of Cutta Cutta Caves. The pipeline alignment crosses the major waterways of the Katherine and Daly Rivers, minor streams of the King River and Bradshaw Creek and many ephemeral creeks. The main rivers are perennial but the levels are subject to considerable fluctuations during flooding. Their channels are relatively narrow and have alluvial banks up to 20 metres high. The plains between the rivers are relatively stable because of the gentle slopes and sandy mantles. This stability is seen in the presence of mature soils, protected by the vegetation even in peak flooding periods (Wright 1965:60)

The terrain in the Tipperary region is either gently undulating or level plains of red soils and limestone, soft sandstone or laterite low rises (Aldrich and Wilson 1992). The geological structural entity of the Daly River Basin consists of deeply weathered older and younger plains where there are Middle-Cambrian limestone, sandstone and siltstone overlying the Lower Cambrian basalt and Upper Proterozoic sandstone, siltstone and greywacke (Speck *et al.* 1961).

The area consists of two major geomorphic regions of the plateaux and the plains. The Central Low Plateau between the Daly and Katherine Rivers has a relief of less than 30 metres and is the most varied of the region consisting of stony plateaux interspersed with either sandy or stony undulating terrain. The Eastern Low Plateaux in the area where the pipeline alignment crosses the Stuart Highway is gently undulating with discontinuous rocky escarpments up to 20 metres.

The Southern Plains between Bradshaw Creek and the Daly River consist mainly of plains of residual soils, plains with rock outcrop or sandy or stony undulating terrain. There are also minor stony areas and narrow alluvial plains adjacent to the main rivers. Southeast and southwest of Katherine is the Northern Plains characterised by stony plains and undulating terrain of relatively unweathered limestone, sandstone and siltstone. There is also a smaller areas of this unit located between Bradshaw Creek and the Daly River

3.2.1. Environmental factors affecting the archaeological visibility.

While the majority of the Tipperary region consists of undulating or level plains there are areas of low rocky ridges, rocky outcrops and stony plains and eroding red soils near creeks where archaeological material will be more likely to be found on the surface.

3.3. Roper District

The four major rivers or creeks that cross the pipeline alignment are Beswick Creek, the Waterhouse River, Flying Fox Creek, and Mainoru Rivers. The majority of the pipeline alignment crosses the physiographic units of the Dissected Gulf Fall and the sandstone Roper geologic group where almost the entire old Tertiary surface has been eroded leaving broad valleys lying between sandstone strike ridges and hilly dissected country (Aldrich and Wilson 1992). The western section of the pipeline is on the Daly River province described above. Between Flying Fox Creek and the Mainoru River the pipeline crosses the Redcliff Pound geological group that contains small sills of dolerite.

The majority of the pipeline route in the Tipperary region is located on sandy undulating plains that have linear sandstone ridges lying across the direction of drainage and siltstone and stoney laterite on other upper slopes). These areas of broad shallow valleys have slow to moderate erosion and sediment removal.

Between KP 440 and KP460 approximately 20 kilometres east of Beswick the pipeline route is located on the low hills and foot slopes of the Arnhem Land escarpment where the lateritic clay on the sandstone cap rock has been incised. This area has rapid erosion and sediment removal. The area between Bukalorkmi and Flying Fox Creek consists of broad or narrow fluvial corridors and gently undulating plains where there is very slow erosion and sediment removal.

As the land in this area has been used for cattle stations there will be many areas, especially around water ways where the landscape will have been degraded and disturbed.

3.3.1. Environmental factors affecting the archaeological visibility

There is only a low potential for locating archaeological material on the majority of the pipeline route that crosses either broad plains or floodplains where sediments are deposited. The areas that have more potential are stony hills, ridges and outcrops and around any dolerite outcrops that may have been used in the past as a source of raw material for the manufacture of stone artefacts. The disturbance by cattle particularly around waterways will impact upon the spatial integrity of any archaeological material located in these areas. There will be a higher potential for locating artefacts along the major waterways.

3.4. Arnhem Land District

The major tectonic unit over which the pipeline crosses the Arnhem Land district is the McArthur Basin where there are depositions of immense volumes of sediments (Lynch and Wilson 1998). Along the western coast near the Gove Peninsula is a small area of the Arnhem Block that exposes the oldest rocks in Arnhem Land, the Basement Granites.

There are four geological regions, the Roper Group consisting of quartz sandstone, siltstone and shale with dolerite sills common. This group is located over the most westerly section of the Arnhem Land region to the Goyder River. The second major group is the Cretaceous Sediments consisting of a series of sandstones, claystones, mudstones and siltstones covered by extensive laterisation and is located between the Goyder River to just west of the Mitchell Ranges and also a larger area from east of the ranges to near the Gove Peninsula. There are two minor groups, the Ritarango Beds of the Mitchell Ranges made up of quartz sandstone, and the Basement Granites located west of the Mitchell Ranges and adjacent to the coast near the Gove Peninsula.

In central Arnhem Land the alignment crosses several larger rivers of the Wilton River, the Annie Creek system and the Goyder River. Between the Goyder and the Badalngarrnirri River, a distance of 60 kilometres, there are very few creeks but there are several waterholes and lakes in the vicinity of the pipeline route. Creeks and rivers are more common in eastern Arnhem Land, the larger ones being the Buckingham River, Boggy Creek, the Cato River, Giddy Creek and the Latram River.

The western area of the Arnhem Land region consists mainly of either deep sandy soil plains and isolated swampy depressions or undulating sandy slopes, rises and low hills of sandstone. Between Annie Creek area and the Mitchell Ranges the pipeline crosses either the sandy plains of the Queue land system or the usually stony plains and rises of the Mululu land system that also contains outcrops of sandstone, siltstone and laterite.

Between the Mitchell Ranges and the Gove Peninsula there are also large areas of the Queue land system and the red soil plains on laterite of the Kay land systems. Nearer Gove in the Giddy land system the plains are on weathered granite with occasional granite and laterite outcrops, the Cato land system of bauxitic plateaux and rises and the Gove land system of bauxitic gravel plains.

3.4.1. Environmental factors affecting the archaeological visibility

The majority of the pipeline route in the western and central areas of Arnhem Land crosses sandy plains where any stone artefacts discarded in the past would have been quickly covered. There is a higher potential for locating artefacts on stony or gravel plains and rises and near water courses in the non sandy areas.

4. CULTURAL SETTING

4.1. Introduction.

The data sources used for this section have been compiled from four principle sources:

1. The archaeological sites register held by the Heritage Branch, (DIPE).
2. The Register of the National Estate, maintained by the Australian Heritage Council.
3. The register of significant places maintained by the National Trust of Australia (Northern Territory Branch).
4. The Northern Territory Heritage Register held by the Heritage Branch (DIPE).

In addition to these sources, published and unpublished documents and reports describing Northern Territory historic places were used. These documents are held by the State Library of the Northern Territory, the Darwin office of the National Trust, the Heritage Branch (DIPE) and the Northern Territory Museum.

4.2. Historic background

A large part of the pipeline route is located on Aboriginal lands that have had only sporadic or minor European intrusions as access has been restricted to non-Aboriginals. The area south of the Daly River was made an Aboriginal Reserve in 1885. This reserve was increased several times and in 1976 ownership was handed over under the Aboriginal Land Rights Act (Stanley 1985). This area includes the western section of the pipeline alignment from Port Keats to approximately 10 kilometres west of Dorisvale Station. Access to Arnhem Land has been restricted since 1931 when the Arnhem Land Aboriginal Reserve was declared and consists of the pipeline alignment from Mainoru Station pastoral lease to the Gove Peninsula. The remoteness of some areas in Arnhem Land meant that there were groups of Aboriginals leading traditional lives until much later in Arnhem Land than areas around European settlements. Even in the late 1930s there were still Aboriginals who had not seen a European (Buck 1995).

In the Katherine area significant European activity commenced in January 1871, when construction teams for the Overland Telegraph Line reached the King River. A repeater site was constructed near the present Katherine township and was used as a depot for the line crews and in time became a nucleus for the development of the pastoral and mining industries.

The establishment of Springvale Station on the Katherine River in 1878 prompted a flurry of pastoral development over the next two decades. By 1880 the majority of the large cattle stations had started, however most of them in the Top End were unsuccessful. For example Florida Station in eastern Arnhem Land on the Goyder River was abandoned in 1893 because of Aboriginal resistance and because the country was unsuitable for cattle (Powell 1996:113). Other pastoral stations established in the late nineteenth century and located close to the pipeline alignment include Beswick, and Mataranka while Mainoru was not established until 1918 (Gleeson and Richards 1985). In the Daly River Basin Florina Station was established in 1916, Jindare in 1917 and Claravale in 1918. The physical remains of the early days of the cattle stations include isolated wooden yards for holding cattle. These structures are often placed near natural water (Thorley 2002).

During the period of pastoral expansion Aboriginal inhabitants started to leave their traditional life style and work on the stations. It was also a time when there was a number of violent conflicts because of the loss of access by Aboriginals to resources and the pollution of waterholes by cattle. The Aboriginals fought back by cattle spearing at waterholes and the pastoralists retaliated by denying access to the water holes by patrolling these areas and shooting Aborigines (McGrath 1987). Disputes with pastoralists were still occurring as late as 1968 when the Rembarrnga people walked from Mainoru Station to the Bulman Waterhole after the new American owners on Mainoru Station wanted to remove the Aboriginal workers and their families from the property.

Permanent European occupation of the Gove and Port Keats region did not begin until 1935 with the establishment of a Methodist Mission at Yirrkalla (Cole 1980:90-91) and a Catholic Mission on the coast at Port Keats (Pye n.d.) although early missions had been established on the Daly River at Ngui and the north coast of Arnhem Land at Milingimbi and Maningrida. This contact with Europeans led to a gradual decline in the reliance on hunting and gathering activities as the Aboriginal population concentrated in these centres (Altman 1995:57).

Geological surveys in 1952 and 1954 proved the existence of high-grade bauxite deposits at Gove Peninsula resulting in the construction of the Nabalco mines and Nhulunbuy township in 1968. The other major development at Gove was the construction of the ELDO (European Launcher Development Organization) Down Range Tracking Station, south of Gove Airport. Following its construction in 1966 the facility was used to track guided missiles launched from Woomera in South Australia. The newly formed Dhuphuma Aboriginal and Transitional College acquired the buildings when the station closed in 1980 (Cole 1980:99).

Mining was also an important activity in the Katherine region following the discovery of tin at Maranboy in 1913. A small settlement including a hospital, market gardens and a stamp battery was established on the field which became the Northern Territory's major tin producer and operated with fluctuating success until the early 1960s (Harlow 1997). The Bulman lead and zinc deposits were discovered and briefly worked in 1910, again in 1925 and the early 1950s (Roberts and Plumb 1963).

The pipeline alignment also crosses the North Australian Railway extension from Katherine to Birdum that was completed in 1929 (Powell 1996:148). A single wire line was also erected from Katherine to the Maranboy tin mines in 1924 (Leonard 1981). Between 1873 and 1899 the original wood poles, which had a tendency to be damaged by white ants, were gradually replaced with the iron Oppenheimer poles.

During World War II numerous military airstrips and camps were constructed along the Stuart Highway and Gove. The Manbullo airstrip is located 15 kilometres south west of Katherine and the proposed pipeline alignment is located just north of the airstrip. It was built in 1942 by the US 43rd Engineer Regiment and operational use ended in July 1944 when the RAAF's No 24 Squadron of B-24 Liberators moved to Fenton airfield. In the Gove area a large base was established by RAAF 13 Squadron to fly bombing missions to the Aru Islands and patrol the shipping lanes between Thursday Island and Darwin (Powell 1988).

4.3. The distribution of historic sites.

In broad historical terms, European activity along the proposed pipeline alignment has been concentrated along the Stuart Highway in the Katherine area and on the Gove Peninsula. The proposed pipeline alignment will cross any remains of the North Australian Railway, and the Overland Telegraph line south of Katherine. The only known World War 11 or mining historic sites located in the vicinity of the alignment are Manbulloo Airstrip and the Maranboy tin mine. Any historic sites on areas that are, or were pastoral leases in the past are most likely in the form of individual graves of Europeans, cattle yards or outstations.

4.4. Ethnographic background

The ethnographic information used in this report does not include information on the different Aboriginal groups that live in the area that the pipeline alignment covers. The ethnographic data is examined to assess Aboriginal subsistence strategies and their material culture that were identified during the post-contact period.

The earliest research in northern Australia on Aboriginal subsistence strategies and material culture was carried out by Basedow (1907), Foelsche (1882) Thomson (1983), Spencer (1914) and Stanner (1933a 1933b). Their observations describe general information regarding Aboriginal life including the various weapons and other implements used during the contact period in the Top End.

Basedow (1907) and Foelsche (1882) give early accounts of subsistence activities in the Top End of Australia. They describe swamps and lagoons as being focal points of subsistence activities providing sources of fish, geese, ducks, turtles, crocodiles and their eggs, shellfish and the roots of water lilies and rushes. Away from the lagoons, wallabies, snakes, goannas and other small game were hunted. Stanner (1933a 1933b), an anthropologist who worked in the Daly River region in the 1930s noted that seasonal factors were a key determinant on camp locations, types of residential grouping, the degree of mobility and the nature of subsistence activities. This influence of seasonal factors was also noted by Altman (1987), Hiatt (1964) and Meehan (1982) in the coastal areas of northwest Arnhem Land.

In Arnhem Land mobility in the wet season was low and people gathered in large groups to co-operate in subsistence production during the hardest time of the annual cycle, although Tindale (1925-6) during a visit to upper reaches of the Roper River, noted that during the wet season food was plentiful but travel was uncomfortable resulting in camps being occupied for up to 4 to 5 weeks. The people dispersed into smaller groups across their country when freshwater was readily available and came together again in the late dry season near permanent water and used this time for ceremonies. Thomson (1983) mentioned several important ceremonies that were held in the late dry season during October and November, even though bush food was scarce and quite inadequate for the needs of large groups. An example of the importance of freshwater as a limiting factor in mobility over the country was given by Thomson (1983:75) when he was unable to locate anyone who knew the country between Mainoru Station and the Goyder River as the area consisted of dry sand ridges. This implies that the area was not used often because of the lack of water.

In eastern Arnhem Land Thomson (1983:90,93,105-107) also recorded the consumption of honey, lizards, snakes and their eggs, fresh water molluscs and fifty different plants either fruit, tubers or roots of which the cycad nut was most important. Some of the vegetable foods were processed using two stones to grind to a paste. Thomson also observed the use of the scapula of a red kangaroo as a knife to slice yams and the construction of different types of fish traps using saplings, mud and grass built across creeks.

The earliest recorded visits by foreigners, besides explorers, to the north Australian coast were the Macassan trepangers who arrived in the area in the early 1700s (MacKnight 1972, 1976). The Aborigines received metal axes and other goods in return for items such as tortoise shell, pearl-shell, pearl, and sandalwood (Baker 1984:7). The Macassan trips continued until 1907 when the visits were terminated by the government. After the European contact the Aboriginal tools were being made less from stone and more from glass and metal although Warner (1969:450) observed that the technique of grinding stone axes was still known in the late 1920s.

Over the Top End there were numerous systems of exchange of goods observed by Berndt (1951) and Stanner (1934). Items transferred in the exchanges included ochre, hair belts, human hair for twine, dilly bags, boomerangs, pearl and baler and shell, armbands, girdles, wax, fish nets and lines, spears, spear throwers, stone knives, feathered string, and European goods. Mitchell (1994) concluded that there was an increase in trade and ceremonies among Aboriginal groups in northern Arnhem Land stimulated by foreign goods such as iron, cloth and tobacco introduced by the Macassan trepangers. The Macassans are also thought to have introduced diseases that decimated the population and disrupted the social stability of the region (Mitchell 2000).

The only items likely to survive in the archaeological record are shell fish hooks, hearths containing cooking stone or termites nests, stone tools such as spear heads, axes, and shells used either in the manufacture of implements or large shells such as *Melo amphora*, used as water vessels Brockwell (1995). After the arrival of Europeans the raw materials used in the manufacture of these items were substituted with iron, porcelain, glass and wire.

4.5. Archaeological background

There has been very little archaeological research carried out in the regions where the pipeline is to be located. Much of the pipeline route crosses isolated areas where even today access is difficult.

Early archaeological research in the vicinity of the pipeline alignment concentrated around the Port Keats and Katherine regions. This research tended to examine individual sites rather than explore how the archaeological record can be used to interpret past Aboriginal regional subsistence strategies. This method of research has only been documented over the last ten years in the Daly River and Katherine areas (the Tipperary region in this report). The number of archaeological and historic sites outside of the Tipperary region is very small, reflecting the lack of archaeological research carried out in these areas and the absence of European involvement in Aboriginal lands.

During the late 1950s in the Port Keats district Stanner excavated the Yarar rockshelter and collected artefacts from the nearby open site, Nyik (Gregory 1998). These two sites are located approximately 10 kms south of the pipeline alignment. In the Katherine district Macintosh (1951) excavated a rock shelter at Tandandjal Cave near Beswick south east of Katherine. Reay (1962) examined the rock art around the town of Katherine, Katherine Gorge and Kintore Caves and Chaloupka has recorded many rock art sites (the reports now held at MAGNT) on the Arnhem Land plateau and around the Fitzmaurice River, south of Port Keats. In the Wardaman country, approximately 100 kilometres southwest of Katherine and the Katherine region the earliest excavations carried out by Davidson (1935), Mulvaney and Golson (Mulvaney 1975) who examined the sequence of stone tool types, the antiquity of sites, site use and the rock art. The research by Mountford and Brandl (1968) and Arndt (1962) in the Wardaman country focussed on the rock art of the region.

Mulvaney's (1975) excavation at Yingalarri revealed engraved sandstone fragments in pre-5000BP context. In more recent times another radiocarbon date of around 5200 years ago was estimated at Garnawala I and 10,000 years ago at Gordol-ya (David et al. 1995). Radiocarbon dates of other excavated sites in the area indicate a late Holocene period of occupation (Clarkson 2001, David et al. 1995). Analysis of stone artefact sequences from several rock shelters in the Wardaman country revealed major technological changes and subsistence strategies over the last 1,000 years (Clarkson 2001, Attenbrow *et al*. 1995: Clarkson and David 1995) with an increase in the reliance of standardised, and multifunctional tools from around 3000 years ago.

Descriptions of the more recent archaeological research have been divided into the four regions that the proposed pipeline alignment crosses. This information, together with the conclusions from the environmental and ethnographic background is then used to discuss the expected distribution of archaeological sites along the pipeline route.

4.5.1. The Ord – Victoria Region

There are only three archaeological sites recorded for the whole of the Port Keats region on the archaeological Site Register held by NT Heritage Advisory Services (DIPE). None of these sites are located within the pipeline alignment. Two of the sites, Yarrar and Papangarla are rock shelters sites and the other site is located on the coast and maybe a Macassan site.

Yarar is a rock shelter that contains occupational debris, rock paintings and engravings and a floor made up of platforms of several levels. Most of the paintings are of abstract designs in red and white pigment and the engravings are composed of a series of short parallel lines. Papangarla contains art and the main designs are parallel red and white lines and five grinding hollows.

The material excavated or collected from Yarar and Nyik by Stanner has been re-analysed by Flood (1967) and Gregory (1998). They concluded that both sites would have been occupied in the late wet to early dry, as they are located near creeks that contain water only in the wet season. At Nyik the majority of stone artefacts were manufactured from quartzite with minor quartz, silcrete and volcanic material. Types of artefacts identified were cores, retouched flakes and points. Gregory (1998) proposed that this site was used as a base camp or procurement site. Yarar also had a similar assemblage of stone tool types and raw materials.

Gregory's summary (Gregory 1998:127-133) of the locations of archaeological sites in the Ord-Victoria region divided the environment into several environmental systems, three of which the pipeline alignment crosses. These are the lowlands, the uplands and the inland plains. In the lowland coastal plains the majority of sites were located in rock shelters in rock outcrops and less frequently on plains, hills, low rises and ridges. Most sites were within 200 metres of ephemeral rather than permanent water sources. The uplands sites were most frequently situated on river or creek beds and in this area the sites consisted of similar frequencies of open sites and rock shelters. Overall most sites were rock shelters located on higher ground and adjacent to water. While there was a higher proportion of sites within 200 metres from water than in the lowlands, some sites were situated up to two kilometres from the nearest source of water. The inland plains sites are mostly open sites located on the plains within 200 metres of a generally ephemeral water source. There is a small percent of sites located less than 500 metres from permanent water.

4.5.2. Tipperary Region

Recent archaeological research in this region has been focused in two areas, the Daly River Basin and the Tindal RAAF Base. In the Daly River area there have been two important archaeological investigations by Guse (2001) who examined the distribution of Aboriginal archaeological material in the Daly Basin region and Thorley (2002) who identified land units where significant archaeological and heritage places and objects were likely to occur. While these two surveys concentrated mainly on areas north of the proposed pipeline alignment their findings are applicable to this report.

The majority of the artefact scatters located during Thorley's (2002) and Guse's (2001) surveys (Figure 4.1) were on highly eroded, older levee banks or gullies and on plains in heavily eroded areas. This suggests that the visibility of archaeological material is highly dependent on the exposure of subsurface material through erosion. Three of the chert quarries were located in areas of siltstone / limestone outcrops.

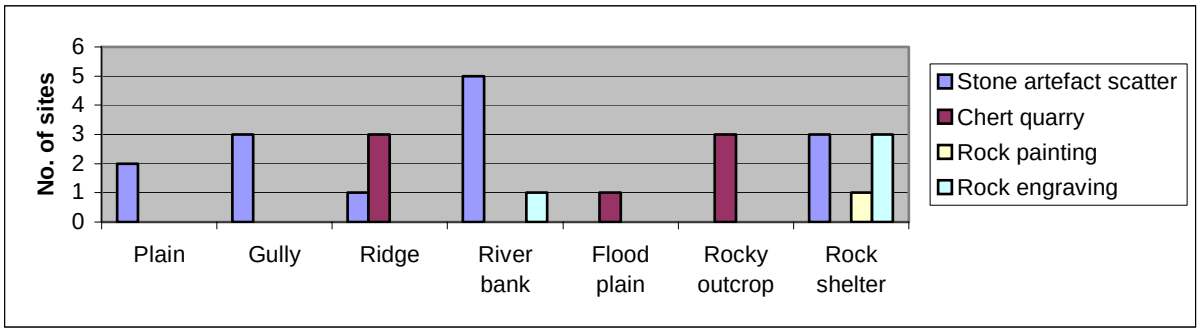


Figure 4.1. Summary of site types and their eenvironment, Daly River region

The majority of stone artefacts were manufactured from chert with smaller proportions of quartzite, quartz, greywacke, silicified siltstone and hornfels. The artefacts consisted of bifacial and unifacial points and other retouched flakes, hammerstones, cores and unretouched flakes. All the quarries were extracting chert.

Thorley's (2002) archaeological assessment of the region found that in the Douglas/Daly region:

- The dominant raw material for stone artefacts are red brown and buff coloured chert, and outcrops of small chert nodules are found on the top of small crests and ridges (Thorley 2002:35)
- The artefact scatters consist of small quantities of debitage (Thorley 2002:36).
- In low lying areas, behind levees, or minor drainage floors within younger levees stone artefacts will only be located after there has been at least 20cm of erosion. Thorley (2002:) states;

"It may be necessary to remove 50cm of sterile sediment before reaching any artefact-bearing horizons which may render subsurface testing costly and difficult to justify except in exceptional cases".

- The majority of artefact scatters and background scatters will be found in the severely eroded areas associated with the major river alluvials (Thorley 2002:44). It is unlikely that any archaeological material will be located on the more recent levee banks as there has been a shorter period for erosion to occur, thus not exposing any artefacts.
- Flat to undulating terrain away from watercourses will have very little archaeological potential (Thorley 2002:32).

An archaeological survey carried out by Crassweller (2002a) along the Daly River and approximately 70 kilometres downstream from where the pipeline crosses the river, located six stone artefact scatters on the sides of the highly eroding older levee banks of the river. The relocation of some of the stone artefacts during the scouring of the slopes by water run off destroyed most of the stratigraphic integrity of the sites. The dimensions of the sites were the result of this movement rather than an indication of the original size of the site. The sites were all small, sparse artefact scatters with similar stone raw material and very few retouched artefacts, indicating the sites were not centres for the manufacture of artefacts, rather they were made for immediate use from locally available raw material. The levee banks were also the location for the majority of the background scatters suggesting that that there may be a continuous scatter of artefacts along the margins of the river.

Hughes (1983) carried out the archaeological base line study for the original environmental impact assessment for the Tindal RAAF base located approximately 2 kilometres north of the pipeline corridor. This was followed by a systematic survey by Hughes and Baker (1983). They located 46 sites that included stone artefact scatters, fourteen rock shelters, two quarries, six rock art sites and two non-Aboriginal sites, the majority of which were rock shelters with occupational debris. Sites were often associated with major creeks, rock outcrops and sinkholes that provided either shelter, water and food resources or raw material for the manufacture of stone artefacts. Consequently there is a higher likelihood for the location of archaeological sites in this type of environment than on the featureless plains. Isolated stone artefacts were recorded over every type of environment. The rock art sites located away from the escarpment tend to be located in isolated rock outcrops or ridges located in the plains areas.

Hughes (1983:3-61) also noted that Arndt collected about 3-4000 artefacts from 67 sites in the Katherine area of which 10% were recognisable as implements and 90% were waste flakes. The removal of all stone artefacts from some sites and the more notable artefacts from others will have a major affect for any predictions of site location and content in the Katherine area.

4.5.3. Roper District

The nearest location to this section of the route where there has been any major archaeological research has been in Kakadu National Park 70 kilometres to the north of the alignment where the research examined settlement patterns and rock art studies in western Arnhem Land. Fortunately the pipeline tends to avoid escarpment country where there is a higher potential for locating rock art sites. The nearest recorded rock art sites are located on the Wilton River at Bulman Gorge approximately 10 kilometres north of the area .In the Beswick area there are two rock shelter, Tandandjal and Beswick Cave both with art. These sites are l, located two kilometers north of the proposed pipeline and 20 kilometres east of Bamiyili, and Beswick Cave that is located seven kilometers from the old Beswick Homestead at the head of a gorge. Tandandjal Cave excavated in 1949 by Macintosh (1951) and yielded stone artefacts, bone, shell charcoal and ochre. It also contained a stone arrangement on the rock shelter floor. The material has not been analysed in detail**.**

The sites recorded on the NT Heritage's records in vicinity of the pipeline alignment in the Roper region consist of a tree blazed by the explorer and surveyor David Lindsay, Site No. 5568-0001,and two rock art sites 5468-0001and 5770-0001. The carved tree is also an Indicative Place on the Register of

the National Estate and is located approximately 20 kilometres south east of Bulman and therefore will not be affected by the proposed development. The two rock art sites are also located outside the pipeline corridor between 7 and 9 kilometres north of the alignment east of Bamiyili.

4.5.4. Arnhem Land District

The majority of archaeological sites documented in Arnhem Land are coastal sites of either Aboriginal shell middens or the remains of Macassan trepanging sites consisting of stone lines, tamarind trees and pottery (Baker 1984). The earliest archaeological research in Arnhem Land occurred between 1927-28 when Warner (1969) excavated two shell middens in the Milingimbi area. Then in 1948 McCarthy and Setzler (1960) carried out research on Groote Eylandt and the coastal areas of Yirrkala and Milingimbi. There was an unsystematic collection of stone artefacts brought to the researchers by the local people including hammerstones of various raw materials, and controlled surface examinations of several areas. Two sites were excavated in the vicinity of Yirrkala. One site Jelangbara Cave fifteen miles south of Yirrkala contained marine shell and stone artefacts manufactured from a ferruginous shale, quartzite and limonite. Artefacts consisted of unifacial and bifacial points, retouched flakes (scrapers), small unretouched flakes, mortars, abrading stones and small flakes. The other excavated site was a Macassan trepanging site at Port Bradshaw and contained tamarind trees, stone lines, cooking pits, pottery and human remains

There is only one inland site that has been described in detail for the western or south central Arnhem Land region. The Ngilipitji Quarry located in the hills near the Walker River approximately 60 kilometres south of the pipeline corridor probably consists of at least three separate quarry areas several kilometres apart. One of the quarry areas was estimated by Thomson (1983:72) to cover several hectares. The quartzite raw boulders are found embedded in the ground and are usually extracted by digging pits around the boulder and then levering the boulders from the ground. The stone is used to manufacture large stone points, blades used for circumcision ceremonies and stone axes which are circulated over a vast area (Jones and White 1988:73). Thomson (1983) had seen some of the stone points tools wrapped separately in paperbark in the Goyder and Roper River areas as well as Caledon Bay south of the Gove Peninsula.

Jones and White (1988:56,57). also mention several less important quartzite quarries, one located next to a creek crossing on the Nhulunbuy Road west of the Mitchell Ranges area and another 30 kilometres east of the Goyder River. Their exact locations are unknown.

The Northern Territory Archaeological Site Register has listed only one site (6273-0010) within 500 metres of the pipeline alignment. However this site will not be impacted by the development as the proposed pipeline alignment on the Gove Peninsula is confined to an already disturbed area along the conveyor belt.

4.6. The distribution of archaeological material.

The above discussions of the environmental, ethnographic and archaeological background suggests that there are several common factors that may predict the presence or absence of archaeological material. The ethnographic data suggests archaeological material is more likely to be located near rivers, creeks and billabongs as they were a focal point in Aboriginal settlement patterns providing both food and water. While the majority of archaeological sites will be located less than 200 metres from either a permanent or ephemeral water source, locating these sites may be difficult. There are vast areas of the pipeline route that are located on sandy plains and it is unlikely that artefacts will remain long on the surface, even along eroding creek banks where they would be quickly covered after the annual wet season floods

Only the Tipperary region has had any detailed archaeological research into site distribution patterns and several of Thorley's prediction (Thorley 2002) for locating archaeological material in the Tipperary region can be transposed to similar environments in the other three regions. He suggested that archaeological material would be scarce on the flat to undulating terrain or on the more recent levee banks. Most material would be located in the severely eroded sections of major rivers or after at

least 20 centimetres of erosion has occurred along minor water courses. These findings could be useful when planning the methodology for the next stage of archaeological surveys along the pipeline.

In the coastal plains area of the Ord-Victoria region open sites were not frequent and tended to be located near ephemeral rather than permanent water. The majority of open sites in the inland plains area and the rock shelters on the edge of the escarpment were most frequently located close to water.

Along the major rivers and creeks west of Katherine there may be a continuous background scatter of isolated artefacts along the levee banks of rivers and larger creeks and in the area south of Katherine sites are more likely to be located along major creeks, rock outcrops and sinkholes. Rock art sites may be identified on isolated rock outcrops in this area.

There has had very little archaeological research carried out in either inland Arnhem Land or the Roper regions. As both these regions have large stretches of the pipeline route crossing sandy plains there appears to be little likelihood of identifying many sites or artefacts on the surface in this environment. Ethnographic data also suggests sandy plains were not frequently crossed by Aboriginals in the past.

In the Roper region there is an increased potential for locating artefacts in the higher rocky ground of the southern edge of the Arnhem Land escarpment and in both the Roper and Arnhem Land region the presence of dolerite outcrops may increase the potential for locating quarries. The only recorded archaeological surveys in inland Arnhem Land identified several quarries next to creeks in the Mitchell Ranges area.

As noted before the lack of archaeological material located in areas adjacent to the pipeline route does not necessarily indicate that no archaeological material exists. It is more a reflection of the lack of archaeological field work carried out in these areas.

5. METHODOLOGY

The scope of works submitted to the Office of Environment and Heritage for the environmental assessment for the proposed pipeline alignment divided the archaeological and heritage component into several stages of survey intensity that would result in full coverage of the pipeline alignment ensuring that heritage sites are not damaged or destroyed. However the aim of the 2003 and 2004 preliminary surveys was to identify a suitable 100 metres wide pipeline corridor that avoided any cultural or environmental areas of value. During these surveys the majority of the pipeline route was surveyed therefore making the scope of works provided by the Office of Environment and Heritage redundant

5.1. Preliminary survey 2003 and 2004

The survey group included archaeologists, environmental and flora specialists, geo-technical terrain specialists, a pipeline engineer who was plotting the route, and Aboriginal traditional owners. The geo-technical team was required to drill holes a maximum of five kilometres apart along the route to assess soil depth and structure. In reality the distances between drill holes was less than five kilometres as holes were also drilled when the geomorphology of an area changed. The flora specialists were required to note vegetation changes along the route and the traditional owners were required to identify areas of cultural significance.

Begnaze was required to carry out two archaeological undertakings. The first was to ensure that the area to be drilled by the geo-technical team contained no archaeological material that would be disturbed by the drilling. The second was to identify any archaeological sites or objects located on or near the proposed pipeline route and infrastructure such as compression stations. The findings from the survey were then used to identify archaeologically sensitive areas to be avoided, or when avoidance is not possible, to recommend alternate routes or mitigation strategies to lessen the impact of the loss or damage of archaeological and heritage places and objects.

During the 2004 field work surveys were also carried out over eight small areas that may be cleared for construction camps and compressions stations.

5.2. Survey procedures

The aims of the fieldwork were to locate and record any archaeological or historic objects or places in the vicinity of the proposed pipeline to ensure that the provisions of the *Northern Territory Heritage Conservation Act 1991* are not contravened. The archaeological survey was carried out as follows:

- The archaeological and heritage study identified archaeological material within the designated area by means of a survey carried out in a manner that ensured the highest possible coverage of the area.

- Any archaeological or heritage places, objects or classes of objects located during the survey were recorded in such detail as to permit independent assessment of their significance. The location of any archaeological places and objects included coordinates obtained by a Global Positioning System. All sites were named in order to identify the sites on the ground.

- After assessing the significance of the archaeological place or object, recommendations were made regarding compliance with the provisions of the *Northern Territory Heritage Conservation Act 1991*

The archaeological survey of the pipeline section consisted of both vehicular and pedestrian transects. The vehicular transects were made as close as possible to the centre of the pipeline alignment and the vehicle usually traveled between 5-10 kilometres per hour. Pedestrian transect were then made over areas where archaeological material was detected.

Pedestrian transects were also made every time the survey party stopped, that is every time a hole was drilled, when the flora survey crew found vegetation of interest, when mechanical failures occurred, or when there was a location where there was a higher potential for locating archaeological sites, such as areas adjacent to waterways, higher ground or eroded areas. This method resulted in both random and purposive pedestrian transects.

Generally the transects were made along the length of the pipeline with the two archaeologists walking in opposite direction away from the location given in the table describing the transect details (Appendix 3). The return transect to that point was made between 30 – 50 metres from the first transect. Where pedestrian transects were made in areas where there were landscape features such as creeks or hills, the transects were made either along or over these features.

Results of the pedestrian transects were individually recorded and consisted of their location, environmental context, ground surface visibility and the number of sites and isolated artefacts encountered. This allowed for the density of sites and background scatters within different environments to be accurately recorded.

The pedestrian transects made over the areas that may be used as construction camps or compressions stations consisted of parallel transects no more than 50 -100 metres apart.

The surveys were carried out by either Christine Crassweller and Helen Haritos or Silvano Jung.

The following sections contain information about fieldwork methods employed in this study including the identification and recording of archaeological sites and materials and the criteria used for the assessment of their significance.

5.2.1. Types of archaeological sites

There are six types of sites previously recorded in the region and they can broadly be defined as follows:

- *Artefact scatters.* These may contain flaked or ground artefacts and hearthstones. They occur as surface scatters of materials or as stratified deposits when there has been repeated occupations.

- *Shell middens* contain mollusc material in the form of surface scatters or mounded deposits (Gregory 1998:222), which represent the remains of human meals.

- *Stone arrangements* range from simple cairns to more elaborate arrangements. These stone arrangements were used in ceremonial activities and represent sacred or totemic sites. Other stone arrangements were constructed for route or territory markers, the walls of huts, fish traps or small walls to stop water from entering a rock shelter or to retain the floor.

- *Art sites* include stencils and paintings where material was added to the rock surfaces or engravings or poundings where the pictures or designs are produced by the removal of material from the rock surface (Clegg 1983).

- *Rockshelter sites* contain a deposit of cultural material that has built up over time and contain flaked or ground stone artefacts, faunal material and other Aboriginal cultural remains.

- *Stone quarries* are generally sites where stone for flaked or edge ground artefacts has been extracted from an outcropping source of rock (Hiscock and Mitchell 1993).

5.2.2. Site definition

An archaeological site is defined for this survey as a concentration of artefactual material with an average density that is 5 times greater than the average density of the background scatter and there are more than five artefacts or shells which cover an area of at least $1m^2$. A site will have an identifiable boundary where either artefact densities decrease to the extent as to be classified as background scatter or environmental features determine the boundary.

Background scatter is generally a very low density, more or less continuous distribution of isolated artefacts over the landscape. Although these artefacts do not constitute a site they are still protected under the *NT Heritage Conservation Act (*1991) as prescribed objects and are given location details and general descriptions for research purposes.

5.2.3. Artefact identification

A requirement for a successful archaeological project involves the accurate identification of archaeological materials. For an object to be identified as a flaked object it needs to possess one or more of the following:

- a positive or negative ring crack.
- a distinct positive or negative bulb of percussion.
- a distinct eraillure scar in an appropriate position below the platform.
- definite remnants of flake scars on dorsal surface or ridges.

Stone artefacts are divided into four main types of cores, unretouched flakes, retouched flakes and flaked pieces (Hiscock 1984:128-129). They are defined as follows:

- *cores* are pieces of stone that have one or more negative flake scars and the absence of positive scars.
- *unretouched flakes* are pieces of stone that have been struck off another piece of stone and ideally possess platforms, positive bulbs of percussion, concentric ripples, ring cracks and /or eraillure scars on the ventral surface.
- *retouched flakes* are flaked flakes. They are identified by the presence of negative scars that must have been created after the ventral surface of the flake had been created. There will be either negative scars on the ventral surface or negative scars on the dorsal surface, which have been formed by the flake being hit on the ventral surface.
- *flaked piece*s are stone artefacts that have been formed by knapping but cannot be identified as either a core or a flake.

Other artefact and implement types that have been identified in the top end of the Northern Territory are listed below following characteristics outlined by McCarthy (1976).

- *Unifacial points* are flakes that have been retouched along the margins from one surface, either ventral or dorsal to give or enhance its pointed shape. They are sometimes symmetrical or leaf shaped.
- *Bifacial points* are retouched along both ventral and dorsal surfaces of a flake to enhance or give the artefact its pointed shape. They may have the platform removed and the proximal end rounded.
- *Edge ground axes* have been shaped by the process of flaking, pecking and polishing. They generally have only one working edge that has been ground to a sharp margin although occasionally they may have two leading edges.
- *Grindstones* are characterized by a worn and abraded surface or surfaces. There also may be a concave surface.
- *Hammerstones* have use wear on the surface in the form of abrasion, pitting, and edge fracturing with some negative scarring.
- *Manuports* are stone material that are not found naturally in an area and must have been carried in by humans.

6. RESULTS

6.1. Overview of archaeology and historic heritage along proposed TTP route

The first part of the results section summarises the range and frequency of archaeological material within the pipeline corridor that were recorded during the 2003 and 2004 surveys or were identified during the background research. A more detailed description follows where the results of the surveys have been divided into the four sections that correspond to the four environmental regions used previously in the report. The section ends with a discussion on distribution of Aboriginal archaeological remains in each land system.

6.1.1. Sites recorded under Commonwealth legislation.

There are no historic or archaeological sites recorded on the Register of the National Estate or on the National Heritage List located on or near the Trans Territory Pipeline.

6.1.2. Sites recorded under Northern Territory legislation

There are eighteen archaeological sites listed on the NT Archaeological Sites register that are located within the 10 kilometre wide pipeline corridor. However as the majority are all over 1.5 kilometres from the proposed pipeline alignment they will not be disturbed by the development. On the Gove Peninsula the pipeline corridor is confined to an area adjacent to the existing Alcan conveyor belt in an area that has been previously cleared. Site 6273-0010, a shell midden, is located less than 500 metres from the pipeline in this area. However as this site is situated outside the corridor it will not be disturbed.

6.1.3. Archaeological and heritage places and objects located during the survey

There were 505 pedestrian transects made along, or as near as possible to the pipeline alignment. Details of the transects are located in Appendix 3. The pedestrian transects covered 314 kilometres on or adjacent to the proposed pipeline corridor. This includes approximately 33 kilometres and 54 pedestrian transects that were made over the Mainoru bypass that is now not part of the proposed pipeline route and transects made over the proposed construction camps and compression stations. This produced an average of one transect every 2 kilometres along the proposed pipeline excluding the transects made along the Mainoru bypass.

A transect was made at a total of 268 drill holes, of which twenty seven were made along the discarded Mainoru section. There was only one incident during the inspection of the drill holes where the drilling team had to be moved away from an archaeological site and on several occasions during the surveys of the proposed pipeline, changes were made to the route to avoid archaeological sites.

Overall there were surprisingly few historic and archaeological sites or objects located during the 2003 and 2004 surveys in the vicinity of the pipeline. These consisted of 34 Aboriginal archaeological sites, 6 historic sites and 84 background scatters of isolated stone artefacts (Table 6.1.) The most common archaeological sites were open artefact scatters with smaller numbers of rock shelters with stone artefacts, quarries, stone arrangements and skeletal remains. The historic sites were related to World War 11 activities, surveying activities, the pastoral industry, the North Australian Railway and the Overland Telegraph line and were located in the vicinity of the Stuart and Victoria Highways south of Katherine in the Roper and Tipperary regions. The descriptions of the individual historic or archaeological sites and the background scatters and are located in Appendix 1 and 2 respectively.

Table 6.1. Frequency of background scatters and site types recorded in each region

Region	B.S scatters	B.S Frequency	Total sites	Site Frequency	Artefact scatter	Quarry	Skeletal remains	Stone arrang.	Rock shelter	Historic
Ord-Vic	15	1/5.4 km	11	1/7.3km	4	2			5	
Tipp.	18	1/1.8km	13	1/2.4km	7	2				4
Roper	23	1/3.1km	6	1/11.7km	2		11	1		2
A/ Land	28	1/4.7km	10	1/13km	9			1		
Total	84		40		22	4	1	2	5	6

Using the total distance covered by pedestrian transects in each region (Table 6.1.) also shows that in the vicinity of the pipeline corridor both sites and background scatters were identified most frequently in the Tipperary region. The Roper and Arnhem Land regions had very low site frequencies and Arnhem Land and the Ord-Victoria regions had the lowest frequencies for background scatters.

Approximately 80% of the background scatters in the Ord-Victoria, Tipperary and Arnhem Land regions contained one or two artefacts. In the Roper region there were 75% background scatters that contained one or two artefacts. The dominant raw material in the Tipperary, Roper and Arnhem Land regions was chert while in the Ord-Victoria quartzite and silcrete were dominant.

6.1.4. Environmental factors affecting the distribution of archaeological material

When an archaeological site or background scatter was identified during the surveys the local environment was also recorded. These environments were then reduced to five main categories:

- Within 200 metres of a source of freshwater and includes rivers, creeks, both ephemeral and permanent, billabongs and swamps
- Higher ground such as hills, rises, terraces and ridges
- Plains, including undulating and level ground on the top of plateaux
- Isolated stone outcrops
- Edges of escarpments

Table 6.2. shows that the majority (62%) of the archaeological material was located adjacent to a source of fresh water, followed by higher ground, escarpments, plains and isolated outcrops. When the location of the archaeological material is separated into sites and background scatters it was found that while the majority of sites and background scatters are located near water or higher ground, sites were never found in the plains areas. Therefore from this it can be predicted that archaeological material will be more frequent near water and high ground, that sites will be rare on plains or undulating country and isolated artefacts may be located in areas where there are no landscape features.

Table 6.2. Proportion of archaeological material located near different landscape features

	Water	Higher ground	Plain	Outcrop	Escarpment
All archaeological material	62%	22%	9%	2%	5%
Sites	59%	17%	-	6%	18%
Background scatters	63%	24%	13%	-	-

6.1.5. Proposed construction camps and compressions sites

The results of the surveys over the proposed construction or compressions sites are shown in Table 6.3. All of the surveyed areas were on relatively level or gently undulating terrain, except for the proposed Moyle construction camp where there was a steep stony hill in the western section of the area. Two of the proposed areas to be disturbed are adjacent to a source of water and contain isolated

artefacts. Background Scatter 78 was located approximately 50 metres outside the scraper facility on the eastern side of the Moyle River and Background Scatters 65 and 66 were located along the western banks of Chinaman Creek south of the Victoria highway. As the disturbed area is approximately 100 west of the creek these artefacts will not be directly disturbed by the proposed compressor site.

Table 6.3. Details of surveys over proposed compression and construction camp sites.

General location	Kilometre Point	Pedestrian transect number (2004 survey)	Archaeological material located
Moyle River	75	38	BS 78
Wingate Ranges	160	30	
Victoria Highway	315	23	BS65 and 66
Stuart Highway	360	22	
Mainoru	530	13	
East of Bulman	630	2 and 3	
Buckingham River	780	48	
West of Gapuwiyak Rd	880	40	

6.1.6. Archaeological visibility

The low number of archaeological sites and isolated artefacts is probably a reflection of the type of terrain over which the pipeline route crosses. The pipeline route favours level ground and avoids, where possible, rugged terrain, escarpments, hills and areas prone to long term flooding after the wet season. The route also covers vast areas of sandy plains or undulating country, where there is less potential for locating archaeological material. During the surveys it was noted that no archaeological material was located near any water sources where the banks were sandy.

As there is a concern that surface visibility may have played a part in locating artefacts, the influence of ground visibility was assessed as a factor in detecting sites by calculating a rough guide averaging out the ground visibility for all pedestrian transects in each region in 2003 and 2004. Table 6.4. shows that ground visibility was higher in the 2003 survey that was carried out in the late dry season when much of the countryside had been burnt off. The 2004 survey was carried out between July and September after a late wet season. As a result there was a lower proportion of the proposed route where the surface had been cleared by fire. It should be noted that the very low average ground visibility for the 2004 survey in Tipperary occurs because only four transects were made.

When the average ground visibility is calculated over both years there is only a small difference between the four regions. These figures indicate that ground visibility was low for both surveys and it is considered that the detection of isolated artefacts may have been hindered by the low visibility. However as the survey methods included targeting areas where it was predicted there would be a high probability for the presence of sites and also targeting areas within each random transects where ground visibility was higher than the surrounding area, it is considered that the low number of sites detected is not the result of low ground surface visibility.

Table 6.4. Average ground surface visibility for each region in 2003 and 2004.

Region	2003 average visibility %	2004 average visibility %	2003 & 2004 average visibility %
Ord-Victoria	58	51	53
Tipperary	60	25	55
Roper	63	37	49
Arnhem Land	65	50	56

The following sections describe the archaeological material located within each region in more detail.

6.2. Ord-Victoria region

All of the archaeological sites located during the survey were located on, or adjacent to, the high plateaux of the Wingate Mountains. No archaeological sites were located in the coastal plains area between the proposed Blacktip processing plant and the edge of the Wingate Mountains to the east. All but three of the background scatters (Background Scatters 21, 22 and 23) were also located on the Wingate Mountains. No historic heritage sites were located during this section of the survey.

6.2.1. Aboriginal archaeological sites in the Ord Victoria region

Eleven archaeological sites were located during 108 pedestrian transects totalling 80.56 kilometres in the Ord-Victoria region and all were located either on or adjacent to the Wingate Ranges and none on the coastal plains areas. Five rock shelters, three of the stone artefact scatters and two quartzite quarries were located on top of the Wingates. The fourth stone artefact scatter was located at the base of the range in the east. Table 6.5. summarises the location of the sites and Table 6.6. shows site details.

Table 6.5. Archaeological sites located during the survey in the Ord Victoria region

Site No.	Lat	Long	Easting	Northing	Type	Environment	Metres (approx) from pipeline
9	-14.4878	131.2180	52 739062	8397167	Rock shelter	Escarpment edge	250
10	-14.4884	131.2182	52 739082	8397095	Rock shelter	Escarpment edge	200
11	-14.4887	131.2187	52 739138	8397064	Stone artefact scatter	Escarpment edge	205
12	-14.4878	131.2207	52 739358	8397166	Rock shelter	Escarpment edge	360
35	-14.4912	131.2152	52 738748	8396788	Rock shelter	Escarpment edge	200
36	-14.4850	131.2329	52 740671	8397464	Stone artefact scatter	Creek	85
37	-14.4513	130.7768	52 691522	8401618	Rock shelter	Escarpment edge	880
37a	-143384	130.4105	52 652108	8414380	Stone artefact scatter	Creek	880
38	-14.3340	130.3992	52 650893	8414878	Stone artefact scatter	Creek	890
39	-14.3212	130.3485	52 645434	8416325	Quarry	Creek	300
40	-14.2727	130.2497	52 634806	8421746	Quarry	Creek	1.9km

Four of the rock shelters and one of the stone artefact scatters were located within a kilometre of each other on the eastern edge of the Wingate plateau. The fifth rock shelter was located on the northern edge of the plateau 30 metres from an ephemeral creek in the valley below. The three other stone artefact scatters were all located adjacent to creeks as were both of the quarries. The type of dominant raw material was quartzite and silcrete on the western side of the Wingates and silcrete, chert and siltstone on the eastern side. Below is a summary of the different types of sites.

The Rockshelters

The rockshelters Sites 9,10 and 11 were located in small caves on the top of a steep sided, ferruginous sandstone escarpment overlooking the same valley. Site 35 was a rock overhang located half way up a steep gully approximately 3 kilometres south of the other rockshelters. The escarpment edge was usually rock strewn and not generally formed in such a way that rockshelters would be a common occurrence.

All these sites contained roof fall onto bedrock floors and evidence of water channelling on the sandy floor areas in Sites 9, 12 and 35 The traditional owners, who were with the survey team, requested that no photographs be taken of these sites and their contents.

Stone artefacts were located in all sites and consisted of either siltstone, silcrete or chert cores, retouched and unretouched flakes. An edge ground axe was located in Site 35. Site 9 contained one grinding hollow on the floor near the back wall. Site35 contained six small drill holes on top of smooth boulders located on the floor and a single line of stones some of which were large siltstone cores.

Site 35 was a rock overhang on top of a very steep sided escarpment on the northern side of the Wingate Ranges. The site had been extremely disturbed by donkey trails that have altered the shape of the side of the hill and left only a small proportion of the archaeological material in place. However on the edges of the disturbed area stone artefacts can be seen in situ in a deposit of up to one metre deep. The artefacts were manufactured from a wide range of raw material and contained a relatively high number of retouched flakes.

Table 6.6. Summary of site details in the Ord Victoria region.

Site No.	Site name	Dimensions (m)	Average density /m^2	Maximum density /m^2	Dominant raw material	Average length of flake (mm)
9	Rock Shelter 1	12 x 6 x 2	0.6	8	Silcrete	35
10	Rock Shelter 2	10 x 5 x 3	0.1	1	Silcrete/siltstone	30
11	Knapping Site	2 x 1	10	12	FGS	40
12	Rock Shelter 3	9 x 3 x 1	0.04	4	Silcrete/siltstone	35
35	Rock Shelter 4	12 x 5 x 3	0.2	3	Siltstone	58
36	Stone Artefact Scatter 20	23 x 8	0.1	6	Chert/quartzite	30
37	Rock Shelter 5	10 x 5	10	25	Dolerite	50
37a	Stone Artefact Scatter 21	100 x 10	0.1	9	Quartzite	40
38	Stone Artefact Scatter 22	100 x 30	0.1	14	Quartzite	
39	Quarry 3	130 x 110	40	60	Quartzite	65
40	Quarry 4	310 x 65	40	80	Quartzite	45

The quarries

The two quarries are very similar in that they are both located adjacent to permanent creeks and the stone artefacts are located over a large area. The sites consist of low quartzite outcrops and not all of the exposed areas of quartzite have been utilised as a raw material source. Both sites had areas where there was a high density of artefacts. Several other areas of quartzite outcrops were examined during the survey on the Wingate Mountains and none of them had been used as a quarry. These outcrops were some distance from a source of fresh water, so it is suggested that quartzite outcrops near a source of water were the preferred option.

Stone artefact scatters

Three of the artefact scatters were located adjacent to permanent creeks. While Site 36 was located at the base of the escarpment and the artefacts were eroding out of a low hill, Site 37a and 38, were located on stable gentle slopes along the same spring fed creek on the western side of the Wingate Range. They both consisted of three areas of artefact concentrations with only a few artefacts located between the concentrations. Site 11 was a knapping site of one event using a fine sedimentary stone that the traditional owners said was sourced in the west. This site was located on top of the escarpment near the three rock shelters.

6.2.2. Background scatters in the Ord-Victoria region

Four of the fifteen background scatters (BS21-23, 78) were located on the coastal plains area of the Ord-Victoria region, two adjacent to creeks, the third on the top a rocky ridge and the fourth next to a creek at the base of the Wingate Mountains (Table 6.7.). Eight of the remaining background scatters (BS70-77) were located on the eastern and central area of the Wingate Plateau not far from

permanent fresh water, either spring fed creeks or swamps. Three of the background scatters (BS67-69) were located on the eastern edge of the Wingate Plateau, two near the escarpment edge and one on a undulating plain near a small isolated hill and several kilometres from either permanent water or the edge of the escarpment.

Table 6.7. Background scatters located during the survey in the Ord Victoria region

B. S No.	Lat	Long	Easting	Northing	Transect (m)	Visibility %	Environment
21	-14.3581	129.9571	52 603202	8412455	400	100	Creek
22	-14.3003	129.6807	52 573411	8518951	400	65	Ridge
23	-14.3121	129.5643	52 560854	8417682	700	80	Creek
67	-14.4884	131.2256	52 739882	8397095	8000	90	Saddle between 2 hills
68	-14.4869	131.2083	52 738016	8397279	700	90	Plateau
69	-14.4072	130.6692	52 679961	8406684	1700	25	Low hill on plateau
70	-14.4059	130.5873	52 671130	8406789	600	50	Edge of swamp
71	-14.4115	130.5847	52 670873	8406181	200	20	Edge of swamp
72	-14.4438	130.5669	52 668899	8402611	800	50	Edge of swamp
73	-14.3367	130.1096	52 652013	8414576	1000	60	Edge of swamp
74	-14.3343	130.3775	52 648554	8414956	600	60	Edge of swamp
75	-14.3192	130.3514	52 645739	8416559	1000	50	Creek
76	-14.28406	130.2131	52 630852	8420516	1600	40	Creek
77	-14.2735	130.1713	52 626346	8421696	450	45	Plateau
78	-14.2760	130.670	52 615079	8421486	1200	95	Creek

The majority (56%) of the isolated stone artefacts were flakes, the majority of which were manufactured from silcrete and quartzite and 18% of these flakes were retouched (Table 6.8). The artefacts on the coastal plain were all flakes (one retouched) or flaked pieces and dominated by silcrete while there were equal proportions of quartzite and silcrete flakes on the Wingate Mountains. All the cores, the majority of which were quartzite, were located on the Wingates and the grinding stones were located at the eastern base of the range.

Table 6.8. Summary of isolated artefacts located in the Ord-Victoria region

Type	Sandstone	Quartzite	Chert	Silcrete	Quartz	FGS	Total No.	Total %
Flake	1	6	1	7	1	3	19	56
Retouched flake	-	1	-	5	-	-	6	18
Core	-	4	1	-	-	-	5	15
Flaked piece	-	1	-	1	-	-	2	6
Grinding stone	2		-	-		-	2	6
Total No.	3	12	2	13	1	3	34	
Total %	9	35	6	38	3	9		

6.2.2. Distribution of sites in the Ord-Victoria region.

The low density of archaeological material located during the surveys in the Ord-Victoria region may be the result of the geomorphology that contributes to much of the archaeological material not being located on the surface. In the wet season much of the coastal plains area is subject to flooding on the plains and scouring along the sides of the creeks and rivers. This results in archaeological material being covered over by silts on the plains and scoured away from the creek banks. These processes may also be occurring on the top of Wingate Ranges that also consists of plains or undulating country. The only areas where artefacts may be more visible are erosional areas along the edges of the escarpments and rocky outcrops and creeks where there is little soil deposition.

During the survey there were two sections of alignment that were greater than 30 kilometres in length where no archaeological material was located at all. These are :

- KP 29 to KP60 on the coastal plains
- KP 162 to KP 213 on the western section of the Wingate Range

Of these two areas there is a higher potential for locating archaeological material on the coastal plains section as the pipeline route crosses several areas of small creeks, while there are very few creeks on the western section of the Wingate Ranges.

6.3. Tipperary

The survey consisted of sixty nine pedestrian transects that totalled 32.325 kilometres in length in the Tipperary region. The average distance between pedestrian transects was 2.3 kilometres. During this section of the survey nine archaeological and four historic sites were located within the Tipperary region (Tables 6.9 and 6.10.).

6.3.1. Historic sites in the Tipperary region

The historic sites were related to the North Australian Railway and World War 11. The proposed pipeline alignment transects two sections of the Manbulloo Airstrip constructed in 1942. To the south of the pipeline are two features made of 44 gallon drums and to the north are the remains of concrete floors and a large excavated area that has been reinforced with stone walls. The distance between these two sections is approximately 2 kilometres and at this stage it does not appear that these structures will be disturbed by the construction of the pipeline.

The pipeline will cross the remains of the North Australian Railway line. However the line in the area that will be disturbed consists only of the gravel base on which the line was laid.

Table 6.9. Historic sites in theTipperary region

Site No.	Site Name	Lat	Long	Easting	Northing	Map Sheet	Distance from pipeline alignment
15	Manbulloo Airstrip 1	-14.5874	132.1853	52 196719	8385427	Manbulloo	130
23	North Australian Railway	-14.6112	132.5750	52 238760	8383285	Maranboy	0 metres
34	Manbulloo Airstrip 2	-14.5732	132.1816	52 196311	8386993	Manbulloo	1.4km

6.3.2. Aboriginal archaeological sites located in the Tipperary region

The archaeological material consisted of two quarries, seven stone artefact scatters and eighteen background scatters. There was only one site located between Bradshaw Creek and the Daly River and this site was located on a hill in an area that was mostly plains or undulating terrain. One artefact scatter, one quarry and three background scatters were located adjacent to the Daly River and then no archaeological material was located between the Daly and Katherine Rivers and only three isolated artefacts were identified along the sides of the Katherine River.

Two small artefact scatters and seven background scatters were clustered along seven kilometres of the pipeline alignment located approximately four kilometres east of the Victoria Highway in an area where there were many small ephemeral tributaries. The stone artefacts were located adjacent to the creeks and eroding out of large patches of red soil where the gentle slopes had

been eroded by sheet wash. The remaining three artefact scatters were also located in a similar environment on the banks of ephemeral creeks.

Table 6.10. Archaeological sites located during the survey in the Tipperary region

Site No.	Lat	Long	Easting	Northing	Type	Environment	Distance from pipeline (m)
13	-14.5050	131.6179	53 782163	8394802	Stone artefact scatter	Hill	105
14	-14.5050	131.6695	53 787734	2394746	Quarry	Hill	145
16	-14.5056	131.6760	53 788431	8694672	Stone artefact scatter	River	86
17	-14.5809	132.1218	53 189866	8386060	Quarry	Rocky outcrop	110
18	-14.5862	132.1976	53 198049	8385581	Stone artefact scatter	Creek	20
19	-14.5898	132.2151	53 199939	8385200	Stone artefact scatter	Creek	360
20	-14.6191	132.3962	53 219497	8382191	Stone artefact scatter	Creek	50
21	-14.6231	132.4573	53 226091	8381820	Stone artefact scatter	Creek	30
22	-14.6191	132.4923	53 229852	8382305	Stone artefact scatter	Creek	80

The majority of the stone artefact scatters and quarries were small and had a low density of artefacts (Table 6.11.). The dimensions of the artefact scatters were often a measurement of the eroded areas that contained artefacts on the surface. Chert was the dominant raw material and for all sites, except for Site 16, there was a very low proportion of retouched flakes.

Site 16 located on the rocky banks of the Daly River had the highest density of artefacts. However as this site is located in an unstable area where the surface would be regularly removed and then covered by a new deposit every time the river floods, the number of artefacts present may be related more to taphonomic than cultural processes.

The raw material used in the quarry located near the Daly River was chert nodules that were found on steep stony gullies approximately 500 metres from the river. This site also contained a sandstone grindstone and another grindstone was located approximately 250 metres away as an isolated artefact.

The second quarry was situated on an isolated 3 metre high quartzite outcrop located in undulating terrain. Only the southern section of the outcrop appeared to be quarried and there were chert flakes located along the eastern edge of the outcrop.

Table 6.11. Summary of contents of archaeological sites in the Tipperary region

Site No	Length	Width	Average density /m^2	Maximum density /m^2	Dominant raw material	Average length of flake (mm)
13	40	6	0.25	6	Chert	28
14	10	5	0.4	4	Chert	35
16	30	30	1	6	Chert	30
17	5	5	0.7	8	Quartzite	30
18	5	5	0.1	4	Chert	18
19	10	2	0.25	5	Chert/silcrete	12
20	50	50	0.2	6	Chert	20
21	3	3	0.1	4	Chert	30
22	10	20	0.2	8	Chert	15

6.3.3. Background scatters in the Tipperary region

Only three of the eighteen background scatters in the Tipperary region were found between Bradshaw Creek and the Katherine River, a distance of over 70 kilometres and these three were

located next to the Daly River (Table 6.12). The remaining background scatters are found between the Katherine River and the Stuart Highway, which is an area with many small creeks or undulating country with rocky surfaces, where the surface would be either stable or eroding and consequently better for detecting archaeological material.

Table 6.12. Background scatters located during the survey in the Tipperary region

B.S No	Zone	Lat	Long	Easting	Northing	Transect (m)	Visibility %	Environment
24	52	-14.5061	131.6671	787470	8394624	200	85	river
25	52	-14.5057	131.6687	787644	8394665	400	90	river
26	52	-14.5072	131.6705	787840	8394500	400	90	river
27	53	-14.5828	132.0508	182208	8385758	800	45	river
28	53	-14.5863	132.1585	193827	8385519	400	90	stony slope
29	53	-14.5864	132.1990	198200	8385561	400	95	creek
30	53	-14.5863	132.2212	200584	8385603	400	90	rocky terrace
31	53	-14.5884	132.2254	201046	8385375	280	95	rocky terrace
32	53	-14.5902	132.2273	201251	8385172	700	15	creek
33	53	-14.5875	132.2384	202444	8385486	400	50	rocky terrace
34	53	-14.5873	132.2444	203091	8385519	600	90	gentle slope
35	53	-14.5870	132.2458	203240	8385550	600	10	creek
36	53	-14.5956	132.3089	210056	8384686	800	50	hill
37	53	-14.6004	132.3265	211961	8384171	600	100	creek
38	53	-14.6217	132.4476	225043	8381969	240	98	creek
39	53	-14.6233	132.4564	225990	8381800	400	90	gentle slope
65	53	-14.5855	132.1734	195437	8385628	800	35	creek
66	53	-14.5823	132.1732	195411	8385967	800	35	gully

The isolated artefacts in the Tipperary region have a low diversity of raw material and artefact types (Table 6.13.). Most of these artefacts were manufactured from chert (65%) with lower frequencies of silcrete and only one example each of quartz and quartzite. There was only one retouched flake and one of the grinding stones showed signs of also being used as a hammer stone.

Table 6.13. Summary of isolated artefacts recorded in the Tipperary region

Type	Sandstone	Quartzite	Chert	Silcrete	Quartz	Total No.	Total %
Flake			17	7	1	25	74
Retouched flake			1			1	3
Core		1	1			2	6
Flaked piece			3			3	9
Grinding stone	3					3	9
Total No.	3	1	22	7	1	34	
Total %	9	3	65	21	3		

6.3.4. Distribution of Aboriginal archaeological material in the Tipperary region

The majority of artefacts and isolated artefacts were located along the pipeline alignment between the Victoria Highway and the Stuart Highway on areas adjacent to creeks where the surface had been disturbed by erosion. While there were several archaeological sites and objects in the vicinity of the Daly River there was only one site and no background scatters located on the undulating plains between Bradshaw Creek and the Katherine River. These results agree with Thorley's (2002) and Kinhill's (1983) predictions that very little archaeological material will be located on the plains areas in this region.

6.4. Roper Region

One hundred and thirty two pedestrian transect were made in the Roper region that covered 17.59 kilometres. A total of four archaeological sites, three historic sites and twenty three background scatters were identified during the survey. None of the archaeological or historic sites located during the surveys will be disturbed by the development.

6.4.1. Historic sites in the Roper region

During the survey three possible historic sites, a cattle yard, a scarred tree and an Overland Telegraph Pole were identified in the region (Table 6.14.). All are located away from the pipeline alignment and will not be disturbed by the development. The traditional owners stated that a cattle yard called Policeman's Yard, Site 7, was the place where a policeman was speared. However no documented evidence could be located that was related to a spearing in the area. Consequently the site has been retained in the report as an historic site with no historic significance. The scarred tree, Site 33 is located approximately 2 kilometres north of the pipeline alignment on the banks of the Bukalorkmi Creek and was marked by surveyors during the 1970s as a national mapping 3rd order levelling point. While this site is relatively recent it is an unusual occurrence and represents surveying methods that are probably not used today.

The Overland Telegraph Pole, an Oppenheimer pole, may not be related to the original line which is thought to have been located west of the North Australian Railway line in the area south of Katherine The line was perhaps related to a subsidiary line that was constructed between Katherine and Maranboy in 1920s as the wire was facing in a north south direction. If the line was a spur line from the main line it would most likely be in an east west direction.

Table 6.14. Historic sites in the Roper region

Site No.	Site Name	Lat	Long	Easting	Northing	Map Sheet	Distance from pipeline alignment
7	Policeman's yard	-14.17308	133.8142	372033	8432807	Flying Fox	6km
25	Overland Telegraph pole,	-14.6049	132.6253	244176	8384036	Manbulloo	260
33	Marked Tree	-14.4363	133.5348	342068	8403510	Flying Fox	1.2km

6.4.2. Archaeological sites in the Roper Region

Only four archaeological sites were located during the survey of the Roper region, a burial, a stone arrangement and two stone artefact scatters (Table 6.15). The traditional owners who were part of the survey team described the skeletal remains are being located on a high rocky hill approximately 500 metres from the pipeline alignment. As the site was not visited the location and contents of the site cannot be confirmed.

The stone arrangement, Site 30, was a one metre high cairn located on the level summit of a large quartzite outcrop located in undulating country. No other archaeological material was located in the area.

Table 6.15. Summary of archaeological sites identified in the Roper region.

Site No.	Lat	Long	Easting	Northing	Type	Environment	Metres from pipeline alignment
6	-14.0629	134.0210	53 394300	8445100	Skeletal remains	Hill	350
30	-13.84025	134.2201	53 415716	8469775	Stone arrangement	Outcrop	200
31	-13.876	134.1794	53 411326	8465836	Stone artefact scatter	Creek	180
32	-13.876	134.1657	53 409852	8465824	Stone artefact scatter	Creek	1km

The two stone artefact scatters were located approximately one kilometre apart on the banks of Horse Creek (Table 6.16.). At Site 31 all the artefacts were manufactured from dolerite and at Site 32 dolerite was the dominant raw material with smaller proportions of quartzite and silcrete. There were relatively high proportions of retouched flakes and cores at both sites.

Table 6.16. Summary of contents of the aretfact scatters

Site No	Length	Width	Av. Density (/m2)	Maximum density (/m2)	Dominant raw material	Av. Length of flake (mm)
31	15	20	0.1	4	dolerite	50
32	15	5	0.1	7	dolerite	44

6.4.3. Background scatters in the Roper Region

The distribution of background scatters appears to be evenly dispersed along the pipeline alignment in the Roper region with only two areas of approximately 30 kilometres along the route that contained no identified archaeological material.

Table 6.17 is a summary of the contents of twenty three background scatters located during the surveys. The background scatter were located either adjacent to creeks (6) or in eroded area such as rocky slopes (3) or steep hills (2) and stony plains (3).

Table 6.17. Background scatters located in the Roper region

B. S No.	Zone	Lat	Long	Easting	Northing	Visibility %	Transect (m)	Environment
13	53	-14.1530	133.8562	376555	8435050	200	55	creek
14	53	-14.1665	133.8216	372829	8433538	200	80	creek
15	53	-14.2488	133.5277	341157	8424254	600	10	creek
16	53	-14.5054	133.3747	324850	8395750	400	95	creek
17	53	-14.5156	133.3466	321831	8394607	1000	95	hill
18	53	-14.5217	133.2744	314057	8393872	300	50	creek
19	53	-14.5891	133.0228	287000	8386200	600	95	plain
20a	53	-14.5963	132.8695	270488	8385245	900	100	plain
20b	53	-14.5963	132.8659	270100	8385245	1200	50	plain
40	53	-14.6092	132.6078	242296	8383535	800	20	river
41	53	-14.6060	132.6553	247405	8383943	800	40	creek
53	53	-13.8241	134.2391	417764	8471691	400	60	creek
54	53	-13.8765	134.1768	411088	8465799	340	10	creek
55	53	-13.8853	134.1713	410459	8464898	400	5	creek
56	53	-13.8878	134.1678	410763	8464382	800	40	creek
57	53	-13.9425	134.1423	407347	8458467	600	90	creek
58	53	-14.1376	133.9246	383931	8436828	700	5	creek
59	53	-14.1381	133.9220	383648	8436829	800	5	creek

B. S No.	Zone	Lat	Long	Easting	Northing	Visibility %	Transect (m)	Environment
60	53	-14.1387	133.9180	383216	8436761	500	90	creek
61	53	-14.1841	133.8760	383216	8436761	800	95	hill
62	53	-14.2520	133.8048	371046	8424076	800	70	plain
63	53	-14.4558	133.5264	341140	8401323	150	20	hill
64	53	-14.4666	133.5096	339362	8400245	400	50	creek

Table 6.18 shows that the isolated stone artefacts were manufactured from a wide range of raw materials, the most frequent being chert (36%) and dolerite (22%). The majority of the artefacts were unretouched flakes (68.75%) and there was a relatively high proportion of retouched flakes (20%) and cores (14%).

Table 6.18 Summary of isolated artefacts recorded in the Roper region

Type	Sandstone	Chert	Siltstone	Silcrete	Quartzite	Dolerite	F.G.S.	Total No.	Total %
Flake	2	11	4	1	2	7	3	30	60
Retouched flake		1	3		3	2	1	10	20
Core	1	5			1			7	14
Flaked piece		1			1			2	4
Ground axe						1		1	2
Total No.	2	18	7	1	7	11	4	50	
Total %	4	36	14	2	14	22	8		

6.4.4. Distribution of Aboriginal archaeological material in the Roper region

While there were very few archaeological sites located during the surveys there was a regular frequency of isolated artefacts located along the proposed route. There was a 34 kilometre section along the route between KP 476 and KP510 where no archaeological material was located. This is an area where the potential for locating archaeological material is low because of the environmental conditions as the area is low lying and prone to regular flooding. However there is a higher potential for sub-surface material.

6.5. The Arnhem Land Region

In the Arnhem Land region 196 pedestrian transects were made over a distance 131.06 kilometres. While 10 archaeological sites and 28 background scatters were located in the region, 4 of the sites and 8 background scatters were located during the survey along the Mainoru by-pass, which is now not part of the pipeline alignment. These have been italicised in Tables 6.19, 6.20, 6.21 below.

6.5.1. Archaeological sites in the Arnhem Land region

Nine of the ten archaeological sites located in the Arnhem Land region were stone artefact scatters and only one of the scatters was located east of the Annie Creek. Three sites were clustered around Annie Creek, one adjacent to the Horse Creek floodplain, three on the top or slopes of hills and one next to a billabong. Site 5 was an unusual site in that the stone artefacts were all manufactured from ochre and were located around a small soak on the side of a hill.

Table 6.19. Artefact scatters located during the survey in the Arnhem Land region

Site	Lat	Long	Easting	Northing	Type	Environment	Metres from pipeline
1	*-13.9361*	*134.2698*	*53 421122*	*8459215*	*Stone arrangement*	*Creek*	*12k*
2	*-13.9082*	*134.4251*	*53 437891*	*8462346*	*Stone artefact scatter*	*Flood plain*	*22k*
3	*-13.8979*	*134.4836*	*53 444203*	*8463504*	*Stone artefact scatter*	*Hill*	*24km*

Site	Lat	Long	Easting	Northing	Type	Environment	Metres from pipeline
4	*-13.7543*	*134.5916*	*53 455853*	*8479412*	*Stone artefact scatter*	*Billabong*	*34km*
5	-13.3345	134.8054	53 478926	8525861	Stone artefact scatter	Hill	60
24	-12.7031	136.0716	53 616351	8595460	Stone artefact scatter	Creek	60
26	-13.4441	134.6677	53 464023	8513730	Stone artefact scatter	Creek	140
27	-14.4459	134.668	53 464217	8513518	Stone artefact scatter	Creek	60
28	-13.4462	134.6671	53 464021	8513490	Stone artefact scatter	Billabong	20
29	-13.7124	134.3619	53 431008	8483982	Stone artefact scatter	Hill	50

Site 1 consists of two stone arrangements approximately 5 metres apart both consisting of a thin slab of sandstone lying horizontally on either a pile of smaller sandstone rocks or termite mounds at either end of the slabs. The traditional owners stated that they had been constructed during a period of buffalo shooting approximately 4 years ago and the structures were used as barbeque plates.

All the artefact scatters small to medium sized and contained a low density of artefacts that were mainly manufactured from chert and siltstone.

Table 6.20. Summary of the stone artefact scatters in the Arnhem Land region

Site	Length	Width	Av. Density (/m2)	Maximum density (/m2)	Dominant raw material	Av. Length of flake (mm)
2	*4*	*2*	*0.5*	*6*	*Siltstone*	*30*
3	*11*	*8*	*0.2*	*3*	*Chert*	*35*
4	*15*	*6*	*0.1*	*3*	*Siltstone*	*28*
5	5	5	0.5	3	Ochre	
24	10	8	0.015	4	FGS	25
26	11	2	0.3	6	chert	35
27	5	5	0.6	12	chert	35
28	21	6	1	6	chert	50
29	10	5	0.05	4	chert	30

6.5.2. Background scatters in the Arnhem Land Region

The majority of the twenty eight background scatters contained one or two artefacts and were located next to a source of water and nineteen of the them are located adjacent to present alignment. There are only five background scatters located between Annie Creek and the Gove Peninsula.

Background Scatter 49 contained five artefacts all located on a rocky bed of Annie Creek. A high density of isolated artefacts was also noted around the stone artefacts scatters located adjacent to Annie Creek.

Table 6.21. Background scatters located during the survey in the Arnhem Land region

B. S No.	Lat	Long	Easting	Northing	Visibility %	Transect (m)	Environment
1	*-13.9233*	*134.3323*	*427868*	*8460653*	*50*	*1000*	*rocky rise*
2	*-13.9273*	*134.3542*	*430239*	*8460223*	*30*	*800*	*plain*
3	*-13.9120*	*134.3944*	*434572*	*8461923*	*40*	*1200*	*hill*
4	*-13.9123*	*134.4015*	*435344*	*8461893*	*25*	*600*	*flood plain*
5	*-13.8222*	*134.5431*	*450625*	*8471887*	*20*	*600*	*Creek*
6	*-13.8292*	*134.5249*	*448656*	*8471107*	*95*	*600*	*Plain*
7	*-13.7536*	*134.5916*	*455855*	*8479487*	*90*	*1000*	*Creek*
8	*-13.7195*	*134.6081*	*457630*	*8483262*	*80*	*600*	*Creek*
9	-13.0274	134.9764	497437	8559829	100	1200	River
10	-13.1188	134.9505	494635	8549726	30	400	River

B. S No.	Lat	Long	Easting	Northing	Visibility %	Transect (m)	Environment
11	-13.2735	134.8872	487778	8532618	80	500	Hill
12	-13.2986	134.8547	484260	8529841	75	800	Billabong
42	-12.6894	135.7780	584474	8597083	20	640	plain
43	-12.6918	135.8253	589604	8596802	85	800	plain
44	-12.6978	135.9965	608194	8596074	90	600	gentle slope
45	-12.7067	136.0918	618540	859548	85	400	plain
46	-12.6587	136.2834	639370	8600269	80	1600	creek
47	-12.3304	136.7350	688661	8636300	85	800	hill
48	-13.9515	133.9645	388148	8457396	40	400	river
49	-13.4460	134.6678	464050	8313684	75	900	creek
50	-13.4398	134.6733	464037	8513678	75	80	creek
51	-13.6936	134.3825	433226	8486167	15	1350	river
52	-13.7895	134.2810	422281	8475531	80	160	creek
79	-12.4573	136.5379	667141	8622393	25	600	stony slope
80	-12.6902	135.6883	574729	8597023	90	200	river
81	-12.6829	135.6598	571639	8597837	95	500	rocky hill
82	-12.6173	135.8158	588603	8605133	60	600	creek
83	-13.1234	135.1045	511328	8549178	30	1200	river

Table 6.22. shows that there is a much larger range of raw material used to manufacture stone artefacts than in the other regions. As the pipeline covers 350 kilometres across the Territory this diversity is probably a reflection of the large survey area and the availability of different raw material in different areas.

Table 6.22. Summary of isolated artefacts recorded in the Arnhem Land region

Type	Sandstone	Chert	Siltstone	Mudstone	Quartzite	Dolerite	Silcrete	Quartz	FGS	Total No.	Total %
Flake	1	14	5	2	4	3	6		1	36	71
Retouched flake		1		1	2		1		1	6	12
Core		2						1		3	6
Flaked piece						1		2		3	6
Grinding stone	3									3	6
Total No.	4	17	5	3	6	4	7	3	2	51	
Total %	8	33	10	6	12	8	14	6	4		

6.5.3. Distribution of archaeological material in the Arnhem Land region

The lack of archaeological material between Annie Creek and the Gove Peninsula is probably the result of environmental factors. Much of the pipeline route in this area consists of featureless sandy plains where it is unlikely that archaeological material will remain on the surface and where there is some distance between creeks or billabongs. One of the traditional owners mentioned that a lot of the country that the pipeline crosses in central Arnhem Land is called “short cut” country as most of the trips across the country was done along the rivers rather than travelling across the plains between the rivers. There were three areas where no archaeological material was located during the survey:

- Between KP 601 and 641, a distance of 40 kilometres east of the Wilton River and very few creek crossings

- Between KP701 and 782, a distance of 50 kilometres between the Goyder River and the Mitchell Ranges and also has very few creek crossings. The 50 kilometres does not include the area west of the Mitchell Ranges that have not as yet been surveyed
- Between KP 852 and 887, a distance of 35 kilometres between Boggy Creek and the Cato river. While in the western section near Boggy Creek the terrain consists of featureless plains, the section nearer the Cato River the pipeline makes several creek crossings.

Therefore there is more likelihood for locating archaeological material between Boggy Creek and the Cato River than for the other two areas.

6.6. Assessment of archaeological and heritage significance

6.6.1. Archaeological sites.

According to Sullivan and Bowdler (1984) archaeological significance means that a site or object has scientific, archaeological or research value, that is, it has the potential to assist current or future research into problems of human history or other areas of enquiry. The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance, otherwise known as the Burra Charter (Maquis-Kyle and Walker 1992:73) states that the scientific value or research potential of a place depends upon the importance of the data involved, on its rarity, quality or representativenesss, and on the degree to which the place or object may contribute to further substantial information.

Therefore the significance of a site is firstly related to the intactness or integrity of a site, and the state of preservation of the archaeological material. Secondly, if the site has stratigraphic reliability then it may be possible to use the cultural material for dating which will provide a chronology extending back into the past. Thirdly, the representativeness of a site is important either because a site is unusual or because the site has research potential when taken in conjunction with other sites.

In order to effectively manage archaeological resources sites recorded during the 2003 and 2004 surveys have been ranked according to their perceived significance. It must be stressed that these assessments should be regarded as provisional and may be subject to change after additional archaeological surveys have been carried out along the pipeline route.

While there were 40 historic and archaeological sites located during the survey only eighteen of these sites are listed in Table 6.23 as they are locate within 200 metres of the proposed pipeline route and have a higher potential to be disturbed during construction of the pipeline. The detailed justification for the significance assessments of each site is found in Appendix 4.

Table 6.23. Summary of the significance of sites within 200 metres of the alignment.

Site No.	Significance	Comments
5	Moderate to high	Rare site with unusual combination of archaeological material.
13	Moderate	Stone artefact scatter with variety of raw material and artefact types
14	Low-moderate	Intact chert quarry, but fairly common in the Daly Basin
15	High	World War II site, Manbullo Airfield very little disturbance, covers a large area
16	Low	Highly disturbed artefact scatter
17	Moderate to high	Quarry with the potential for excavation
18	Low	Small disturbed artefact scatter with low density of artefacts
20	Moderate	Artefact scatter with a diversity of artefacts of different raw materials
21	Low	Small artefact scatter low diversity and density of artefacts
22	Low	Small artefact scatter low diversity and density of artefacts
23	Low to moderate	Historic railway line, no significant remains at this location
24	Low	Small artefact scatter low diversity and density of artefacts
26	Moderate	Low density of artefact scatter but with a variety of raw material and artefact types
27	Moderate	Low density of artefact scatter but with a variety of raw material and artefact types

Site No.	Significance	Comments
28	Low	Artefact scatter majority of artefacts located in creek bed, highly disturbed
29	Low	Low density artefacts scatter with a diversity of stone artefacts
36	Moderate to high	Medium density artefact scatter with a potential for excavation in undisturbed areas

A number of sites are considered to hold low levels of archaeological significance because their research potential has been greatly compromised by disturbance due to erosion. In addition the density of artefacts and diversity of artefact types in these sites is low. Several of the stone artefact scatters with low archaeological significance contained only 10 – 12 artefacts.

Sites that are likely to be particularly valuable in answering archaeological research questions are given moderate archaeological significance. These sites contain a higher density and diversity of archaeological material and are either particularly well preserved or represent a type of archaeological site that is uncommon in the general area. As there were so very few sites located in certain areas along the pipeline rout, any site located in these areas could be classed as significant on rarity alone. Nonetheless the small artefact scatters with a low density and diversity of artefacts were assessed as having low archaeological significance as their research potential would be minimal and most of the information that can be recorded from these sites has already occurred. Larger sites with a higher density of sites were given a moderate significance as these site have the potential for answering questions regarding settlement patterns, the manufacture of stone artefacts and subsistence strategies in regions where there has been very little previous archaeological research.

There were no sites considered to have a high archaeological value however there were three sites that were assessed as having moderate to high significance. Site 5 consists of an edge ground axe and ochre pieces scattered around a small water soak on the side of a hill. This site is distinctive because of its unusual combination of stone artefacts and has been assessed on its rarity alone. The other two sites, a quarry, Site 17 and an artefact scatter, Site 36 both have the potential to be excavated.

While the density of artefacts on the surface of the quarry is relatively low there is a high possibility of artefacts under the surface. The quarry is located on an outcrop surrounded by undulating plains where artefacts would be buried under the sediment brought to the area during the regular floods.

The majority of stone artefacts at Site 36 were found in areas that had been eroded by sheet wash on a gentle slope next to a creek. As the areas between are intact there is a good potential for locating sub-surface archaeological material in these areas.

6.6.2. Historic sites

There are further criteria that can be considered when assessing the significance of historic sites and these are:

- A site is associated with events, developments or cultural phases in human occupation.
- A site demonstrates a way of life, no longer practiced or in danger of being lost or of exceptional interest
- A site provides information contributing to a broader understanding of the history of human occupation.

It should be noted that historical significance will not necessarily be equated with archaeological significance, as some events may leave nothing in the archaeological record.

There are two historic sites located within 200 metres of the proposed pipeline route, the Manbulloo Airstrip, Site 15 and the North Australian Railway, Site 23. While there are few reminders of the wartime activities in the area adjacent to the runway and south of the proposed pipeline route, the survey located new structures that are in very good condition two kilometres north of the

alignment. As several of the airstrips between Katherine and Darwin have been damaged or destroyed in the last few years, this site is significant as an increasingly rare reminder of World War 11 activities in northern Australia.

While the North Australian railway line played a significant role in opening up the Top End the section of the line that crosses the pipeline route has been assessed as having low historic significance as the remains consist only of the gravel base on which the line was built.

6.6.3. Background scatters

All background scatters located during the surveys have been assessed as having low archaeological significance. The methods used during the survey ensured that the artefact's location, dimensions, type and raw material were documented. Consequently the isolated artefacts have little potential for contributing to further knowledge.

7. POTENTIAL IMPACTS AND RECOMMENDATIONS

This section describes the potential impacts that may be produced by the project on archaeological and historic sites and objects during the design, construction and operational phases of the project. Recommendations are then suggested that will help in the protection of archaeological and historical material, the mitigation of any impacts and to ensure that no offences are committed under *NT Heritage Conservation Act 1991*

Of the 40 archaeological or historic sites identified during the survey thirty one of these are situated within one kilometre of the proposed pipeline alignment. While sites located over one hundred and fifty metres from the alignment are highly unlikely to be affected by the development, there are uncertainties in evaluating any impacts to sites within one hundred and fifty metres of the alignment. The difficulties arise when trying to place precisely archaeological sites and a thirty metre wide corridor on a 1:100,000 map sheet from co-ordinates obtained from a hand held GPS.

Consequently when assessing the project's impacts upon the sites it was decided at this stage of the study to standardise the evaluation by predicting that any sites located within 50 metres of the alignment will most likely be destroyed, within 100 metres of the pipeline alignment will have a high probability of being disturbed and sites located between 100 and 150 metres from the pipeline may be at risk of being disturbed. This process was carried out using the proposed pipeline alignment revision 7.

7.1. Design phase

7.1.1. Impacts

There were several instances when the proposed pipeline alignment was moved to avoid archaeological sites. Along one section of the pipeline route near KP 325 there was a concentration of background scatters and small artefact scatters, all eroding out of creek banks affected by sheet wash. As there were many similar small patches of eroded surface in the area there was a good chance that by moving the proposed pipeline route several hundred metres away other archaeological material may be disturbed.

After the fieldwork was completed and the alignment and sites were mapped, the location of some sites was much closer to the pipeline than when assessed in the field. Consequently there are currently twelve sites located within 100 metres of the centre line of the alignment. The possible impacts upon these sites are :

- Site 36 at KP217 is only 75 metres away from the pipeline is likely to be disturbed.
- Site 16, at KP 266 is an artefact scatter on the Daly River and will not be disturbed at all as the pipeline will be located under the river and the site avoided.
- Site 18, at KP 325 is 20 metres from the pipeline and likely to be destroyed.
- Site 20, at KP 347 is 50 metres from the pipeline and likely to be disturbed.
- Site 21, at KP 354 is 30 metres from the pipeline and likely to be destroyed.
- Site 22, at KP 358 is 80 metres from the pipeline and likely to be disturbed.
- Site 23, at KP 366 is the remains of the North Australian Railway line. As the pipeline cannot avoid crossing the line, at least 30 metres of the line will be destroyed.
- Site 24, at KP 827 is 60 metres from the pipeline and likely to be disturbed.
- Site 29, at KP 597, is 50 metres from the pipeline. As this site is situated half way up a very steep hill and the pipeline is located at the base of the hill it is highly unlikely that the site will be disturbed.
- Site 27, at KP 642 is 60 metres from the pipeline and likely to be disturbed.
- Site 28, at KP 642 is 20 metres from the pipeline and likely to be destroyed.
- Site 5, at KP 661 is 60 metres from the pipeline and likely to be disturbed.
- Site 24, at KP 827 is 60 metres from the pipeline and likely to be disturbed.

As two sites (Site 16 and 29) will not be disturbed by the current pipeline route and the pipeline cannot avoid disturbing the old railway line, there are nine sites where the route could be changed to avoid any impact on the sites.

There are currently six sites located between 100 and 150 metres from the centre of the pipeline alignment that have a lower risk of being disturbed during the construction activities. These sites are shown in Table 7.1. as well as archaeological and historic sites that are located within one kilometre of the pipeline and are not expected to be disturbed.

Table 7.1. Sites not expected to be impacted by the Pipeline Alignment Revision 7.

KP	Site No.	Metres from centre line	Impact
107	39	300m	None
113	38	890m	None
114	37a	880m	None
162	37	880m	None
215	35	200m	None
215	9	250m	None
215	10	200m	None
215	11	205m	None
215	12	360m	None
327	19	360	None
372	25	260	None
543	6	350	None
570	31	180	None
576	30	200	None
260	13	105m	Low risk
266	14	145m	Low risk
317	17	110m	Low risk
324	15	130m	Low risk
642	26	140	Low risk

Forty nine of the eighty four background scatters identified during the survey are located within 150 metres of the proposed centre line of the alignment and may be either disturbed or destroyed during the construction activities.

There are still two areas in central Arnhem Land along the pipeline route that have not been investigated and where the pipeline route may disturb unidentified sites. The areas consist of approximately thirty kilometres northwest of the Mitchell Ranges and approximately 15 kilometres of the route between Annie Creek and the Goyder River. There is a high potential for the presence of archaeological sites in these both these areas. The first lies in an area where there may be rock outcrops used as a source of raw material for the manufacture of stone artefacts, and between the Goyder and Annie Creek there may be artefact scatters near the several permanent sources of fresh water in the area.

7.1.2. Recommendations

As noted above there are nine sites that may be destroyed during the construction phase if the pipeline alignment is not changed. However as five of these sites, Site 18, 21, 22, 28 and 24 have low archaeological significance, it would be unwarranted to realign the pipeline to avoid these sites.

Table 7.2. Summary of recommendations for site protection

KP	Site No.	Metres from centre line	Design Stage Recommendations
217	36	75	Further realignment not necessary.
266	16	86m	Realignment not necessary
325	18	20	Realignment not necessary
347	20	50	Realign pipeline if possible
354	21	30	Realignment not necessary
358	22	80	Realignment not necessary
366	23	0	Realignment not necessary
597	29	50	Realignment not necessary
642	27	60	Further realignment not necessary
642	28	20	Realignment not necessary
661	5	60	Further realignment not necessary
827	24	60	Realignment not necessary

The background scatters located in this survey have also been deemed to have low archaeological significance and therefore there is no need to realign the pipeline to avoid these areas in order to comply with Northern Territory Heritage legislation (Table 7.2.).

This leaves four sites located within 50 metres of the centre line of the alignment that may be destroyed and one site less than 100 metres from the centre line that may be disturbed. Two of these sites have moderate archaeological significance and two have moderate to high archaeological significance. Therefore it is recommended that planned measures to protect the sites be implemented, as described below.

7.2. Construction phase

7.2.1. Impacts

As the exact location of the pipeline route will not be identified until the route is surveyed on the ground it is most likely that there are unidentified archaeological sites and objects that will be disturbed by the construction of the pipeline. The amount of impact on the identified archaeological sites also cannot be identified until the exact route has been located.

During the initial clearing of the pipeline alignment and during the construction phase there is a possibility that there may also be disturbances to sub-surface archaeological materials such as human skeletal remains, stone artefacts, shell middens and the remains of hearths.

7.2.2. Recommendations

The specific recommendations for any mitigation actions that may be required at each site cannot be made until the actual location of the sites and the thirty metre wide pipeline alignment is confirmed on the ground. The general recommendations for the protection and mitigation of archaeological sites that will be disturbed or destroyed by the construction of the pipeline will be as follows:

No further mitigative action is required at sites of low archaeological significance. However as these sites are still protected under the *Heritage Conservation Act 1991* under sections 29 and 39, consent to disturb the sites must be sought from the Minister for Lands, Planning and the Environment. At this stage this recommendation will be attributed to all the background scatters. If during the design stage, the route cannot be realigned there will be nine sites and forty three background scatters that may be either destroyed or damaged. Four of the sites and all of the background scatters have been deemed to have low archaeological significance.

Sites with moderate to high archaeological significance will need various levels of protective actions, including temporary fencing of the site during construction, the necessity to work within a

narrowed corridor, earth moving machinery to operate at a certain distance from the site. If it is not feasible to carry out the protective actions permission to disturb the site must be obtained from the Minister for Infrastructure, Planning and the Environment under the *Heritage Conservation Act 1991,* sections 29 and 39. Before construction begins there will be recommendations for salvage procedures and these may include surface collections and / or excavations of archaeological material.

While there is an undertaking by the proponents to have all the pipeline alignment surveyed by an archaeologist when the surveyors are pegging the route, there are several long sections along the route (discussed in Section 6 above) where the potential for locating archaeological material is very low as the terrain consists of featureless plains and very few creek crossings or other landscape features (Table 7.3).

Table 7.3. Sections of the proposed pipeline route with a low potential for the presence of archaeological sites.

Region	KP-KP	Distance KM
Ord-Vic	162 - 213	51
Tipperary	218-259	41
Tipperary	267 - 309	42
A/Land	601 -641	40
A/Land	701 - 782	50

Therefore it is suggested a complete survey along the above sections is not necessary at the time the surveyors are pegging the route.

It is possible to make several specific recommendations at this time and they are:

- Before any disturbance occurs to the areas along the pipeline it is recommended that that an archaeological survey is carried out during the surveying and pegging of the pipeline alignment to verify which sites will be destroyed or disturbed and to record previously unidentified archaeological material. The 2003 and 2004 surveys identified areas where there is a very low potential for locating archaeological material.

- Site 23, Northern Australian Railway.

As the pipeline will cross over the remains of the old railway line processes should be set up to limit the area to be destroyed. It is recommended that the area to be disturbed is minimal and that the boundaries of the pipeline alignment is appropriately fenced. The area outside the fence line should be delineated as a “no go” area with no pedestrian or vehicular movement, heavy machinery, drilling or grading occurring outside this fenced area.

- Background Scatters Nos. 11, 12, 18, 21, 24–26, 28-30, 33-39, 41-43, 45-47, 49, 50, 54, 55, 58, 59, 61-64, 66, 67, 69, 73, 74, 76-79, 83.

Forty three background scatters are located within 100 metres of the centre of the pipeline alignment and may be destroyed or damaged during the construction of the pipeline .As these sites have been deemed to have low archaeological significance it is recommended that no further mitigative action is needed and a permit to disturb these isolated artefacts should be sought by the proponent from the Heritage Conservation Services, Department of Infrastructure, Planning and Environment, as directed by the *Heritage Conservation Act, NT 1991*.

- Subsurface archaeological material

As it is anticipated that there will be an archaeologist present during most of the pegging of the pipeline route, decisions can be made in the field as to the correct procedures for the protection of sub-surface archaeological material during this period. However during the construction stage it is recommended that a response mechanism is set up to ensure that any archaeological material is not disturbed and is protected. This response should include the cessation of work around the archaeological material, and obtaining advice from the Heritage Conservation Services to ensure that the conditions of the *NT Heritage Conservation Act 1991* are not contravened.

7.3. Operational phase

During this stage the main concern is for the on-going protection of the all sites in the vicinity of the pipeline alignment. The stability of some of the sites would be particularly vulnerable to visitation therefore it is recommended that the location of all archaeological material is not made readily available to employees who will be working in the field.

8. REFERENCES\BIBLIOGRAPHY

Aldrich . JM. and PW. Wilson. 1992. *Lands Systems of the Roper River Catchment*. Technical Report No. 52. Conservation Commission of the Northern Territory.

Altman, J.C. 1995. Hunter-gatherer subsistence production in Arnhem Land: the original affluence hypothesis re-examined. In W.H. Edwards' (ed.) *Traditional Aboriginal Society. A Reader*. McMillans Education , Australia, Melbourne.

Altman, J.C. 1987.*Hunter-Gatherers Today: an Aboriginal economy in north Australia*. Australian Institute of Aboriginal Studies, Canberra.

Arndt, W. 1962. The interpretations of the Delamere Lightning painting and rock engravings, *Oceania* Volume XXXII (3) 163-177.

Attenbrow, V., David, B. and Flood, J. 1995. Mennge-ya and the origin of points. A new insight into the appearance of points in the semi-arid zone of the Northern Territory, *Archaeology in Oceania* 30: 105-19.

Baker, R. 1984. Macassan site survey and bibliography. Unpublished report to the Museums and Art Galleries of the Northern Territory, Darwin.

Basedow. H. 1907. Anthropological notes on the western coastal tribes of the Northern Territory of South Australia. *Transactions and Proceedings and Report of the Royal Society of South Australia,* 31:1-55.

Berndt, RM. 1951 Ceremonial exchange in Western Arnhem Land. *South Western Journal of Anthropology*. 7 (2):156-176.

Brockwell, C.J. 1995. Prehistoric settlement patterns and mobility strategies on the lower Adelaide River, Northern Australia. Unpublished report to Heritage Conservation, Department Land Planning and Environment, Darwin.

Buck, R. 1995. Ronnie Buck. In ed. G. Cowlishaw's *Bulman Oral History Series: Aboriginal Accounts of Interactions with the Domain of White Fellows*, No. 10. Barunga Press, Katherine.

Clarkson, C. 2001. Technological change in Wardaman Country: a report on the 1999 field season, *Australian Aboriginal Studies* (1): 63-68.

Clarkson, C. and David, B. 1995. The antiquity of blades and points revisited. Investigating the emergence of systematic blade production south-west of Arnhem Land, Northern Australia, *The Artefact* 18:22-43.

Clegg, J. 1983. Recording prehistoric art. In ed. G. Connah's *Australian Field Archaeology: A Guide to Techniques*. Australian Institute of Aboriginal Studies, Canberra.

Cole, K. 1980 *Arnhem Land: Places and People*. Rigby: Adelaide

Crassweller, C. 2002a. An archaeological survey of the proposed subdivision on NT Portion Lot 847, Lukies Farm, Douglas / DalyRegion. An unpublished report to Garibaldi Pastoral Pty Ltd.

David, B., Collins, J., Barker, B., Flood, J., Gunn, R. 1995. Archaeological research in Wardaman country, Northern Territory: The Lightning Brothers Project 1990-91 field season. *Australian Archaeology* 41:1-8.

Davidson, D.S. 1935. Archaeological problems of northern Australia. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 65:145-183.

Flood, J. 1967. A point assemblage from the Northern Territory. Archaeology and Physical Anthropology in Oceania 5:27-52.

Foelsche, P. 1882. Notes on the Aborigines of North Australia. *Transactions of the Royal Society of South Australia*, 5:1-18.

Gleeson, J. and M. Richards 1985 Mataranka and the Daly, Two Studies in the History of Settlement in the Northern Territory. North Australian Research Unit: Darwin.

Gregory, R.L. 1998. Aboriginal Settlement Patterns in the Ord-Victoria River Region. Unpublished Ph. D. thesis, Department of Anthropology, Northern Territory University, Darwin. Vol. 1 & 2.

Guse, D. 2001 The Northern Territory archaeological survey stage II, the Daly Basin Bioregion. A draft report for the Heritage Conservation Branch, Department of Infrastructure, Planning and Environment, Darwin.

Harlow, S. 1997 *Tin Gods. A Social History of the Men and Women of Maranboy.* Historical Society of the Northern Territory: Darwin.

Hiatt, L.R. 1965. *Kinship and Conflict. A Study of an Aboriginal Community in Northern Arnhem Land*. The Australian National University, Canberra.

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

Hiscock, P. and Mitchell, S, 1993. *Stone Artefact Quarries and Reduction Sites in Australia: Towards a Type Profile*. Technical Publications Series Number 4. Australian Heritage Commission, Canberra.

Hughes, P.J. 1983. Baseline archaeological study for the RAAF Base Tindal. An unpublished report to Kinhill Stears, for the Department of Housing and Construction.

Hughes, P.J. and Baker, R. 1983. RAAF Tindal environmental studies, archaeological survey and impact assessment. An unpublished report to Kinhill Stears for the Department of Housing and Construction.

Jones, R and N. White 1988. Point blank: stone tool manufacture at the Ngilipitji Quarry, Arnhem Land 1981. In B. Meehan and R, Jones' (eds.) *Archaeology with Ethnography: an Australian Perspective*. pp.51-87. Australian National University, Canberra

Leonard, C. 1981. Post and telegraph history, Katherine District. A report for the Telecommunications Museum Adelaide.

Lynch BT and PL Wilson. 1998 *Land Systems of Arnhem Land.* Natural Resources Division, Department of Lands, Planning and Environment Darwin

Macintosh N.W.G. 1951 Archaeology of Tandandjal Cave, south-west Arnhem land, *Oceania* 21 (3) 178-204.

Macknight, C.C. 1976. *The Voyage to Marege. Macassan trepangers in northern Australia.* Melbourne University Press.

Macknight, C.C. 1972. *Macassans and Aborigines*. Oceania Vol. XLII No.4:283-319

McCarthy, F.D. 1976. *Australian Aboriginal Stone Implements*. The Australian Museum Trust, Canberra.

McCarthy, FD and FM Setzler 1960.The archaeology of Arnhem Land. In CP Mountford's (ed.) *Records of the American-Australian Scientific Expedition to Arnhem Land*. Vol.2. Melbourne University Press

McGrath, A. 1987. *Born in the Cattle: Aborigines in Cattle Country*. Allen and Unwin, Sydney

Maquis-Kyle, P. and M. Walker, 1992. *The Illustrated Burra Charter: Making good decisions about the care of important places*. Australian Heritage Commission, Canberra.

Meehan, B. 1982. *Shell Bed to Shell Midden.* Australian Institute of Aboriginal Studies, Canberra.
Pearson and Sullivan 1995:

Mitchell, S. 2000. Guns or barter? Indigenous exchange networks and the mediation of conflict in post-contact western Arnhem Land. In R Torrence & A. Clarke's (eds.) *The Archaeology of Difference. Negotiating cross-cultural engagements*. Routledge London.

Mitchell, S. 1994. Foreign Contact and Indigenous Economies on the Cobourg Peninsula, Northwestern Arnhem Land. Unpublished PhD thesis, Northern Territory University, Darwin.

Morgan, C.M. 1972 *Port Keats 1:250,00 Geological Series*. Department of National Development, Bureau of Natural Resources, Geology and Geophysics.

Mountford, C.P. and Brandl E.J. 1968. Aboriginal Cave paintings and rock markings at Ingaladdi rock shelter, Willeroo, Northern Territory of Australia, *Records of the South Australian Museum* 15 (4): 679-692.

Mulvaney, D.J. 1975. *The Prehistory of Australia. Revised Edition.* Penguin Books.

Pearson, M. and S. Sullivan 1995. *Looking After Heritage Places: The Basics of Heritage Planning for Managers, Landowners and Administrators*. Melbourne University Press: Melbourne.

Powell, A. 1996. Far Country: *A Short History of the Northern Territory.* Melbourne University Press: Melbourne.

Powell, A. 1988 *The Shadow's Edge: Australia's Air War*. Melbourne University Press: Melbourne.

Pye, J. n.d. *The Port Keats Story*. Coleman's Printer, Darwin.

Reay, M. 1962. Notes on some rock paintings of the Katherine district, Northern Territory. *Mankind* 5. (12): 507-514.

Roberts, H.G. & Plumb, K.A. 1963. *Explanatory Notes on the Mt Marumba 1:250,000 Geological Sheet.* Bureau of Mineral Resources, Geology and Geophysics.

Speck N.H., Wright, R.L., Van de Graaff, R.H.M., Fitzpatrick, E.A., Mabutt J.A. and GA Stewart. 1961. *General Report on the Tipperary area, Northern Territory. Land Research Series No.1*3. Commonwealth Scientific and Industrial Research Organization, Australia.

Spencer, B. 1914 Native Tribes of the Northern Territoryof Australia Macmillan London.

Stanley, O. 1985 *The Mission and Peppimenarti: an Economic Study of the Daly River Communities*. Australian National University, North Australian Research Unit, Darwin.

Stanner, W.E.H 1934. Ceremonial economics of the Mulluk Mulluk and Madngella tribes of the Daly River, North Australia A preliminary Paper O*ceania, 4:156-175.*

Stanner, W.E.H. 1933a. The Daly River Tribes: a report of fieldwork in North Australia, Part 1. O*ceania,* 3: 377-405.

Stanner, W.E.H. 1933b. The Daly River Tribes: a report of fieldwork in North Australia, Part 2. O*ceania,* 4: 10-29.

Stewart, G.A., Perry, R.A., Patterson, S.J., Sleeman, J.R. and DM Traves 1970. Land systems of the Ord-Victoria area. In ed.s. G.A. Stewart, R.A. Perry, S.J. Patterson, D.M. Traves, R.O. Slatyer, P.R. Dunn, P.J. Jones and J.R. Sleeman's . *Lands of the Ord-Victoria Area, Western Australia and Northern Territory*. Land Research Series No. 28. Commonwealth Scientific and Industrial Research Organization, Australia.

Sullivan, M.E. and S. Bowdler 1984. *Site Surveys and Significance Assessment in Australian Archaeology*. Department of Prehistory, Research School of Pacific Studies, ANU, Canberra.

Thomson, D. 1983. *Donald Thomson in Arnhem Land*. Compiled by N.Peterson. Curry O'Neil Ross Melbourne.

Thorley, P. 2002. An archaeological assessment of the Katherine-Daly Basin. An unpublished report for the Department of Infrastructure, Planning and Environment, Darwin.

Tindale, N. 1925-26. Natives of Groote Eyelandt and the west coast of the Gulf of Carpentaria. *Records of the South Australian Museum* Vol. III. Hassell Press Adelaide, pp: 61-135.

Warner, WL. 1969. *A Black Civilisation. A Social Study of an Aboriginal Tribe*. Harper and Row, USA.

Wright, R.L. 1961 Geomorphology of the Tipperary Area. In eds. N.H. Speck., R.L. Wright, R.H.M. Van de Graaff, E.A. Fitzpatrick, J.A. Mabutt. and G.A. Stewart's. *General Report on the Tipperary area, Northern Territory*. Land Research Series No.13. Commonwealth Scientific and Industrial Research Organization, Australia.

Appendix 1
Summary of archaeological and historic sites located during the 2003 and 2004 surveys

Site	Region	Lat	Long	Zone	Easting	Northing	Map sheet	Type	Environment	From pipeline (m)	Kilometre point	Landsystem	Year
1	A/Land	-13.9361	134.2698	53	421122	8459215	Marumba	Stone arrangement	Creek	12k	Mainoru by-pass	Emmerugga	2003
2	A/Land	-13.9082	134.4251	53	437891	8462346	Marumba	Stone artefact scatter	Flood plain	22k	Mainoru by-pass	McArthur	2003
3	A/Land	-13.8979	134.4836	53	444203	8463504	Marumba	Stone artefact scatter	Hill	24k	Mainoru by-pass	Siegal	2003
4	A/Land	-13.7543	134.5916	53	455853	8479412	Nymbilli	Stone artefact scatter	Billabong	21k	Mainoru by-pass	Emmerugga	2003
5	A/Land	-13.3345	134.8054	53	478926	8525861	Fleming	Stone artefact scatter	Hill	30	661	Klatt	2003
6	Roper	-14.0629	134.021	53	394300	8445100	Throsby	Skeletal remains	Hill	350	543	Cliffdale	2003
7	Roper	-14.17308	133.8142	53	372033	8432807	Flying Fox	Policemans Yard	Plain	6000	515	McArthur	2003
9	Ord-Victoria	-14.4878	131.218	52	739062	8397167	Jinduckin	Rock shelter/ artefact scatter	Escarpment edge	250	215	Mullaman	2003
10	Ord-Victoria	-14.4884	131.2182	52	739082	8397095	Jinduckin	Rock shelter/ artefact scatter	Escarpment edge	200	215	Mullaman	2003
11	Ord-Victoria	-14.4887	131.2187	52	739138	8397064	Jinduckin	Stone artefact scatter	Escarpment edge	205	215	Mullaman	2003
12	Ord-Victoria	-14.4878	131.2207	52	739358	8397166	Jinduckin	Rock shelter/ artefact scatter	Escarpment edge	360	215	Mullaman	2003
13	Tipp	-14.505	131.6179	53	782163	8394802	Bowman	Stone artefact scatter	Hill	105	260	Jindara	2003
14	Tipp	-14.505	131.6695	53	787734	8394746	Bowman	Quarry	Hill	145	266	Banyan	2003
15	Tipp	-14.5874	132.1852	53	196719	8385427	Manbulloo	Manbulloo 1	Undulating	132	324	Tagoman	2003
16	Tipp	-14.5056	131.676	53	788431	8694672	Manbulloo	Stone artefact scatter	River	86	266	Banyan	2003
17	Tipp	-14.5809	132.1218	53	189866	8386060	Manbulloo	Quarry	Rocky outcrop	110	317	Tagoman	2003
18	Tipp	-14.5862	132.1976	53	198049	8385581	Manbulloo	Stone artefact scatter	Creek	20	325	Tagoman	2003
19	Tipp	-14.5898	132.2151	53	199939	8385200	Manbulloo	Stone artefact scatter	Creek	360	327	Tagoman	2003
20	Tipp	-14.6191	132.3962	53	219497	8382191	Manbulloo	Stone artefact scatter	Creek	50	347	Kimbya	2003
21	Tipp	-14.6231	132.4573	53	226091	8381820	Manbulloo	Stone artefact scatter	Creek	30	354	Wallingin	2003
22	Tipp	-14.6191	132.4923	53	229852	8382305	Manbulloo	Stone artefact scatter	Creek	80	358	Wallingin	2003
23	Tipp	-14.6111	132.5749	53	238760	8383285	Manbulloo	North Australian Railway	Plain	0	366	Blain	2003
24	A/Land	-12.7031	136.0716	53	616351	8595460	Durabudboi	Stone artefact scatter	Creek	60	827	Keating	2003
25	Roper	-14.6048	132.6253	53	244176	8384036	Maranboy	O'land Telegraph Pole	Plain	260	372	Woggoman	2003
26	A/Land	-13.4441	134.6677	53	464023	8513730	Annie Creek	Stone artefact scatter	Creek	140	642	Flatwood	2003
27	A/Land	-14.4459		53	464217	8513518	Annie Creek	Stone artefact scatter	Creek	20	642	Flatwood	2003
28	A/Land	-13.4462	134.6671	53	464021	8513490	Annie Creek	Stone artefact scatter	Billabong	20	642	Flatwood	2004
29	A/Land	-13.7124	134.3619	53	431008	8483982	Marumba	Stone artefact scatter	Hill	50	597	Favenc	2004

Site	Region	Lat	Long	Zone	Easting	Northing	Map sheet	Type	Environment	From pipeline (m)	Kilometre point	Landsystem	Year
30	Roper	-13.84025	134.2201	53	415716	8469775	Marumba	Stone arrangement	Outcrop	200	576	Flying Fox	2004
31	Roper	-13.876	134.1794	53	411326	8465836	Marumba	Stone artefact scatter	Creek	180	570	Lindsay / Coolibah	2004
32	Roper	-13.876	134.1657	53	409852	8465830	Marumba	Stone artefact scatter	Creek	1050	570	Lindsay / Coolibah	2004
33	Roper	-14.4363	133.5348	53	342068	8403510	Flying Fox	Marked Tree	Creek	1230	475	McArthur	2004
34	Tipp	-14.5732	132.1816	53	196311	8386993	Manbulloo	Manbulloo 2	Undulating	1440	324	Tagoman	2004
35	Ord-Victoria	-14.4912	131.2152	52	738748	8396788	Jindare	Rock shelter/ artefact scatter	Escarpment edge	200	215	Mullaman	2004
36	Ord-Victoria	-14.485	131.2329	52	740671	8397464	Jindare	Stone artefact scatter	Creek	15	217	Mullaman	2004
37	Ord-Victoria	-14.4513	130.7768	52	691522	8401618	Wingate	Rock shelter/ artefact scatter	Escarpment edge	880	162	Wingate	2004
37a	Ord-Victoria	-14.3384	130.4105	52	652108	8414380	Moyle	Stone artefact scatter	Creek	880	114	Wingate	2004
38	Ord-Victoria	-14.334	130.3992	52	650893	8414878	Moyle	Stone artefact scatter	Creek	890	113	Wingate	2004
39	Ord-Victoria	-14.3212	130.3485	52	645434	8416325	Moyle	Quarry	Creek	300	107	Wingate	2004
40	Ord-Victoria	-14.2727	130.2497	52	634806	8421746	Moyle	Quarry	Creek	1900	96	Wingate	2004

Appendix 2
Details of background scatters

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
1	53	427868	8460653	-13.9233	134.3323	Marumba 5770	50	1000	rocky rise	15.3km	Mainoru by-pass	A / Land	Wulkulyi	2	flake	quartzite	110 x 90 x 12
															flake	sandstone	21 x 28 x 6
2	53	430239	8460223	-13.9273	134.3542	Marumba 5770	30	800	plain	17.3km	Mainoru by-pass	A / Land	Emmurugga	1	flake	mudstone	35 x 38 x 12
3	53	434572	8461923	-13.9120	134.3944	Marumba 5770	40	1200	hill	19.3km	Mainoru by-pass	A / Land	Favenc	1	flake	chert	36 x 36 x 20
4	53	435344	8461893	-13.9123	134.4015	Marumba 5770	25	600	near flood plain	19.5km	Mainoru by-pass	A / Land	Favenc	1	flake	dolerite	30 x 40 x 15
5	53	450625	8471887	-13.8222	134.5431	Nymbilli 5870	20	600	creek	22.5km	Mainoru by-pass	A / Land	Emmurugga	2	flake	siltstone	95 x 40 x 20
															flake	dolerite	25 x 10 x 4
6	53	448656	8471107	-13.8292	134.5249	Nymbilli 5870	95	600	plain	22km	Mainoru by-pass	A / Land	Favenc	1	flake	mudstone	52 x 38 x 24
7	53	455855	8479487	-13.7536	134.5916	Nymbilli 5870	100	800	creek	20km	Mainoru by-pass	A / Land	Emmurugga	1	retouched flake	mudstone	35 x 28 x 8
8	53	457630	8483262	-13.7195	134.6081	Nymbilli 5870	80	600	creek	18.4km	Mainoru by-pass	A / Land	Emmurugga	1	flake	dolerite	45 x 32 x 6
9	53	497437	8559829	-13.0274	134.9764	Annie Creek 5871	95	1000	river	15.3km	Mainoru by-pass	A / Land	Levee	1	flake	chert	29 x 15 x 4
10	53	494635	8549726	-13.1188	134.9505	Annie Creek 5871	25	400	river	9km	Mainoru by-pass	A / Land	Flatwood	3	flake	siltstone	30 x 28 x 2
															flake	chert	25 x 19 x 3
															flake	chert	12 x 22 x 8
11	53	487778	8532618	-13.2735	134.8872	Annie Creek 5871	70	800	hill	30	672	A / Land	Mululu	4	flake	chert	36 x 25 x 3
															flake	silcrete	24 x 30 x 11
															flake	fgs	32 x 23 x 7
															core, broken	chert	22 x 28 x 16
12	53	484260	8529841	-13.2986	134.8547	Annie Creek	45	500	billabong	90	668	A / Land	Mululu	6	flake	silcrete	26 x 20 xx 4

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
						5871											
															unifacial point	silcrete	30 x 20 x 4
															grinding stone	sandstone	133 x 110 x 30
															flake with polish	dolerite	25 x 20 x 5
															flake	silcrete	27 x 27 x 5
															flake	silcrete	30 x15 x 4
13	53	376555	8435050	-14.1530	133.8562	Flying Fox 5669	55	200	creek	3.8km	523	Roper River	Strangeways	2	blade flake	siltstone	53 x 32 x 9
															retouched flake	siltstone	93 x 52 x 15
14	53	372829	8433538	-14.1665	133.8216	Flying Fox 5669	80	200	creek	5.5km	520	Roper River	McArthur	1	flake core	sandstone	98 x 69 x 20
15	53	341157	8424254	-14.2488	133.5277	Flying Fox 5669	10	600	creek	18km	488	Roper River		1	flake	quartzite	41 x 41 x 11
16	53	324850	8395750	-14.5054	133.3747	Mataranka 5568	95	400	creek	150	455	Roper River	Weston	3	retouched flake	siltstone	35 x 24 x 17
															flake	chert	42 x 24 x 9
															retouched flake	chert	46 x 20 x 9
17	53	321831	8394607	-14.5156	133.3466	Mataranka 5568	95	1000	hill	150	452	Roper River	Flying Fox	2	retouched flake	fsg	65 x 38 x 15
															flake	fsg	28 x 30 x 9
18	53	314057	8393872	-14.5217	133.2744	Mataranka 5568	50	300	creek	40	444	Roper River	McArthur	1	flake	sandstone	75 x 40 x 15
19	53	287000	8386200	-14.5891	133.0228	Mataranka 5568	95	600	plain	215	415	Roper River	Nutwood	1	flake	sandstone	52 x 62 x 16
20a	53	270488	8385245	-14.5963	132.8695	Maranboy 5468	100	900	plain	245	398	Roper River	Nutwood	2	core	chert	55 x 20 x 28

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
															flake	chert	65 x 50 x 22
20b	53	270100	8385245	-14.5963	132.8659	Maranboy 5468	50	1200	plain	245	398	Roper River	Downs	1	flake	chert	40 x 25 x 11
21	52	603202	8412455	-14.3581	129.9571	Keats 4869	100	400	creek	15	60	Ord-Vic	Angallari	1	flaked piece	quartzite	80 x 53 x 9
22	52	573411	8415951		129.6807	Keats 4869	65	140	ridge			Ord-Vic	Moyle	2	flake	fgs	25 x 20 x 6
															flake	fgs	25 x 16 x 5
23	52	560854	8417682	-14.3121	129.5643	Keats 4869	80	700	creek	125	16	Ord-Vic	Mullaman	9	flaked piece	silcrete	38 x 31 x 8
															flake	silcrete	22 x 20 x 6
															flake	silcrete	32 x 25 x 10
															flake	chert	45 x 20 x 10
															retouched flake	quartzite	25 x 22 x 7
															flake	silcrete	20 x 20 x 15
															flake	quartzite	22 x 35 x 9
															flake	silcrete	8 x 15 x 3
															flake	silcrete	22 x 16 x 4
24	52	787470	8394624	-14.5061	131.6671	Bowman 5268	85	200	river	30	265	Tipperary	Banyan	2	flake	chert	19 x 2 x 2
															flake	silcrete	12 x 10 x 3
25	52	787644	8394665	-14.5057	131.6687	Bowman 5268	90	400	river	75	266	Tipperary	Banyan	1	grinding stone	sandstone	56 x 45 x 26
26	52	787840	8394500	-14.5072	131.6705	Bowman 5268	90	400	river	98	266	Tipperary	Banyan	2	flake	chert	
															flake	chert	
27	53	182208	8385758	-14.5828	132.0508	Manbullo 5368	45	800	river	150	309	Tipperary	Banyan	3	flake	chert	30 x 19 x 12
															flaked piece	chert	16 x 14 x 12
															flake	silcrete	24 x 27 x 8

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
28	53	193827	8385519	-14.5863	132.1585	Manbullo 5368	90	400	stoney slope	75	321	Tipperary	Tagoman	2	flake	silcrete	75 x 45 x 2
															flake	chert	40 x 32 x 9
29	53	198200	8385561	-14.5864	132.1990	Manbullo 5368	95	400	creek	5	325	Tipperary	Tagoman	1	blade	silcrete	39 x 16 x 6
30	53	200584	8385603	-14.5863	132.2212	Manbullo 5368	90	400	rocky terrace	38	328	Tipperary	Tagoman	1	flaked piece	chert	
31	53	201046	8385375	-14.5884	132.2254	Manbullo 5368	95	280	rocky terrace	190	328	Tipperary	Tagoman	2	flake	silcrete	12
													Tagoman	2	flake	chert	12 x 12 x 4
32	53	201251	8385172	-14.5902	132.2273	Manbullo 5368	15	700	creek	390	328	Tipperary	Tagoman	4	flake	chert	23
															flake	chert	19
															flake	silcrete	10
															grinding stone	sandstone	50
33	53	202444	8385486	-14.5875	132.2384	Manbullo 5368	50	400	rocky terrace	70	330	Tipperary	Tagoman	1	retouched flake	chert	52 x 20 x 7
34	53	203091	8385519	-14.5873	132.2444	Manbullo 5368	90	600	gentle slope	48	330	Tipperary	Yujullowan	1	blade	silcrete	50
35	53	203240	8385550	-14.5870	132.2458	Manbullo 5368	10	600	creek	10	330	Tipperary	Tagoman	1	flake	chert	28
36	53	210056	8384686	-14.5956	132.3089	Manbullo 5368	50	800	hill	25	337	Tipperary	Tagoman	2	flake	chert	15
															flake	chert	24
37	53	211961	8384171	-14.6004	132.3265	Manbullo 5368	100	600	creek	25	339	Tipperary	Kimbyan	2	flake	chert	30
															flake	chert	8
38	53	225043	8381969	-14.6217	132.4476	Manbullo 5368	98	240	creek	40	353	Tipperary	Kimbyan	3	flake	quartz?	19
															flake	chert	60

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
															flake	chert	14
39	53	225990	8381800	-14.6233	132.4564	Manbullo 5368	90	400	gentle slope	66	354	Tipperary	Woggomon	4	grinding stone	sandstone	60 x 45 x 38
															flake	chert	22
															flake	chert	19
															flaked piece	chert	12
40	53	242296	8383535	-14.6092	132.6078	Maranboy 5468	20	800	river	150	370	Roper	Woggoman	6	flake	chert	32 x 42
															flake	chert	38 x 26
															flake	chert	27 x 40
															flake	silcrete	48 x 32
															flake	chert	38 x 23
															flake	chert	38 x 26
41	53	247405	8383943	-14.6060	132.6553	Maranboy 5468	40	800	creek	30	375	Roper	Yungman	2	core	chert	60 x 65 x 32
41	53	247405	8383943	-14.6060	132.6553	Maranboy 5468	40	800	creek	30	375	Roper	Yungman		flake	chert	
42	53	584474	8597083	-12.6894	135.7780	Mitchell Ra. 6072	35	640	plain	65	795	A / Land	Queue	1	grinding stone	sandstone	45 x 37 x 36
43	53	589604	8596802	-12.6918	135.8253	Mitchell Ra. 6072	85	800	plain	75	880	A / Land	Queue	1	g. stone broken	sandstone	25 x 14 x 17
44	53	608194	8596074	-12.6978	135.9965	Mitchell Ra. 6072	90	600	gentle slope	190	820	A / Land	Kay	1	flake	siltstone	22 x 13 x 3
45	53	618540	859548	-12.7028	136.0918	Durabudboi 6172	85	400	plain	60	830	A / Land	Keating	1	bifacial	fgs	16 x 11 x 3
46	53	639370	8600269	-12.6587	136.2834	Durabudboi 6172	5	1100	creek	30	851	A / Land	Keating	1	flake	silcrete	25 x 12 x 2
47	53	688661	8636300	-12.3304	136.7350	Gove 6273	85	880	hill	65	917	A / Land	Giddy	1	flaked piece	quartz	13 x 14 x 5

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
48	53	388148	8457396	-13.9515	133.9645	Mainoru 5670	40	400	creek	15km	545	A / Land		2	flake	chert	12 x 7 x 2
															flake	chert	23 x 11 x 5
49	53	464050	8313684	-13.4460	134.6678	Annie Creek 5871	75	900	creek	25	642	A / Land	Flatwood	5	flake	chert	31 x 21 x 6
															flake	chert	37 x 21 x 6
															flake	chert	39 x 21 x 7
															flake	chert	32 x 18 x 5
															core	chert	97 x 82 x 29
50	53	464037	8513678	-13.4398	134.6733	Annie Creek 5871	75	80	creek	95	643	A / Land	Flatwood	1	flake	silcrete	18 x 30 x 4
51	53	433226	8486167	-13.6936	134.3825	Marumba 5770	15	1350	river	170	600	A / Land	McArthur	1	flake	chert	14 x 8 x 4
52	53	422281	8475531	-13.7895	134.2810	Marumba 5770	80	160	creek	450	585	A / Land	Flying Fox	1	flake	chert	24 x 22 x 5
53	53	417764	8471691	-13.8241	134.2391	Marumba 5770	60	400	creek	250	579	Roper	Lindsay/ Coolibah	1	axe (broken)	dolerite	96 x 74 x 38
54	53	411088	8465799	-13.8765	134.1768	Marumba 5770	10	340	creek	10	570	Roper	Lindsay/ Coolibah	7	flake	dolerite	30 x 40 x 8
															retouched flake	dolerite	50 x 27 x 8
															flake	dolerite	14 x 10 x 2
															core	dolerite	88 x 66 x 32
															flake	dolerite	55 x 50 x 8
															flake	dolerite	52 x 35 x 8
															flake	dolerite	50 x 32 x 8
55	53	410459	8464898	-13.8853	134.1713	Marumba 5770	5	400	creek	15	569	Roper	Cliffdale	3	retouched flake	chert	80 x 20
															flake	chert	60 x 40
															core	chert	40 x 40
56	53	410763	8464382	-13.8878	134.1678	Marumba	40	800	creek	180	568	Roper	Cliffdale	3	flake	chert	20 x 19 x 4

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
						5770											
															flake	chert	30 x 14 c 8
															flake	chert	34 x 18 x 6
57	53	407347	8458467	-13.9425	134.1423	Marumba 5770	90	600	creek	710	562	Roper	Strangeways	5	retouched flake	dolerite	45 x 42 x 8
															flake	siltstone	64 x 32 x 12
															flake	siltstone	41 x 51 x 20
															flake	siltstone	61 x 62 x 32
															retouched flake	dolerite	28 x 38 x 8
58	53	383931	8436828	-14.1376	133.9246	Flying Fox 5669	5	700	creek	85	529	Roper	McArthur	4	bifacial point butt	quartzite	31 x 21 x 8
															flake	chert	24 x 18 x 10
															bifacial point butt	quartzite	22 x 28 x 8
															retouched flake	siltstone	41 x 50 x 10
59	53	383648	8436829	-14.1381	133.9220	Flying Fox 5669	5	800	creek	75	529	Roper	McArthur	1	flaked piece	chert	35 x 20
60	53	383216	8436761	-14.1387	133.9180	Flying Fox 5669	90	500	creek	310	529	Roper	McArthur	2	core	chert	60 x 40
															flake	fgs	70 x 50
61	53	383216	8436761	-14.1841	133.8760	Flying Fox 5669	95	800	hill	90	522	Roper	Bukalar	2	flake	silcrete	32 x 21
															flaked piece	quartzite	32 x 31
62	53	371046	8424076	-14.2520	133.8048	Flying Fox 5669	70	800	plain	10	511	Roper	Suprise	3	retouched flake	quartzite	68 x 26 x 10
															flake	chert	18 x 12
															flake	chert	40 x 22

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
63	53	341140	8401323	-14.4558	133.5264	Flying Fox 5669	20	150	hill	20	473	Roper	Emmerugga	1	flake	fgs	48 x 30 x 6
64	53	339362	8400245	-14.4666	133.5096	Flying Fox 5669	50	400	creek	75	471	Roper	Emmerugga	1	flake	quartzite	42 x 48
65	53	195437	8385628	-14.5855	132.1734	Manbullo 5368	35	800	creek	66	323	Tipperary	Tagoman	1	core	chert	20 x 31 x 19
66	53	195411	8385967	-14.5823	132.1732	Manbullo 5368	35	800	gully	415	323	Tipperary	Tagoman	1	core	quartzite	88 x 72 x 56
67	52	739882	8397096	-14.4884	131.2256	Jinduckin 5169	90	8000	hill	30	216	Ord-Vic	Mullaman	1	unretouched flake	sandstone	36 x 42 x 12
68	52	738016	8397279	-14.4871	131.2089	Jinduckin 5169	90	700	plain	140	214	Ord-Vic	Mullaman	1	core	chert	56 x 71 x 35
69	52	679961	8406684	-14.4072	130.6692	Wingate Mts 5069	25	1700	plain	10	148	Ord-Vic	Wingate	1	retouched flake	silcrete	78 x 34 x 14
70	52	671130	8406789	-14.4051	130.5873	Wingate Mts 5069	50	600	swamp/creek	1380	140	Ord-Vic	Wingate	3	retouched flake	silcrete	51 x 30 x 12
															retouched flake	silcrete	37 x 26 x 8
															flake	FGS	31 x 29 x 5
71	52	670873	8406181	-14.4148	130.5847	Wingate Mts 5069	20	200	swamp/creek	905	139	Ord-Vic	Wingate	1	flake	quartzite	30 x 30
72	52	668899	8402611	-14.4439	130.5669	Wingate Mts 5069	50	800	swamp/creek	160	135	Ord-Vic	Wingate	1	flake	silcrete	27 x 24 x 5
73	52	652013	8414576	-14.3474	130.4116	Moyle 4969	60	1000	creek	5	115	Ord-Vic	Wingate	2	retouched flake	silcrete	101 x 36 x 8
															retouched flake	silcrete	40 x 32 x 10
74	52	648554	8414956	-14.3343	130.3775	Moyle 4969	60	600	swamp/creek	50	111	Ord-Vic	Wingate	1	flake	quartzite	70 x 30 x 10
75	52	645739	8416559	-14.3192	130.3514	Moyle 4969	50	1000	creek	620	107	Ord-Vic	Wingate	7	flake	quartzite	22 x 22 x 4
															flake	quartzite	26 x 22 x 8
															core	quartzite	109 x 85 x 46

No.	Zone	Easting	Northing	Lat	Long	Map sheet	Vis. %	Transect (m)	Environment	M.s from p/line	Kilometre Point	Region	Land System	Find	Type	Material	Dimensions (mm)
															core	quartzite	68 x 62 x 48
															core flake	quartzite	40 x 36 x 15
															flake	quartzite	72 x 48 x 10
															core flake	quartzite	180 x 20 x 30
76	52	630852	8420516	-14.2835	130.2132	Moyle 4969	40	1600	river	95	92	Ord-Vic	Wingate	1	flake	silcrete	26 x 16 x 5
77	52	626346	8421696	-14.2735	130.1713	Moyle 4969	45	450	plain	30	88	Ord-Vic	Pinkerton	1	retouched blade	quartz	110 x 50 x8
78	52	615079	8421486	-14.276	130.0671	Moyle 4969	80	1200	creek	70	75	Ord-Vic	Pinkerton	2	grinding stone	sandstone	91 x 88 x 78
															grinding stone	sandstone	82 x 84 x 65
79	53	667141	8622393	-12.4573	136.5379	Gove 6273	25	600	stoney slope	50	888	A / Land	Gove	1	flake	siltstone	45 x 32 x 4
80	53	574729	8597023	-12.6902	135.6883	Mitchell Ra. 6072	90	200	river	740	785	A / Land	Queue	7	bifacial point butt	quartzite	38 x 28 x 6
															flake	quartzite	29 x 21 x 5
															unifacial point tip	quartzite	28 x 22 x 8
															flaked piece	quartz	15 x 29 x 3
															flake	chert	34 x 25 x 5
															flake piece	dolerite	22 x 189 x 4
															flake	siltstone	40 x 32 x 2
81	53	571639	8597837	-12.6829	135.6598	Mitchell Ra. 6072	95	500	rocky hill	630	782	A / Land	Queue	1	core	quartz	41 x 44 x 19
82	53	588603	8605133	-12.6173	135.8158	Mitchell Ra. 6072	60	600	creek	8k	799	A / Land	Queue	1	flake	quartz	90 x 70 x 21
83	53	511328	8549178	-13.1234	135.1045	Fleming 5971	30	1200	river	10	701	A / Land	Levee	1	flake	quartzite	92 x 72 x 22

Appendix 3
Details of pedestrian transects, 2003 and 2004

Details of pedestrian transects, 2003

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
1a	Roper	Favenc	53	399841	8450128	-14.0176	134.0725	95	600			floodplain
2a	Roper	Favenc	53	401428	8454855	-13.9749	134.0874	20	400			hill
2b	*Roper*	*Cliffdale*	*53*	*409167*	*8457032*	*-13.9555*	*134.1591*	*5*	*400*			*floodplain*
3a	*Roper*	*Rsf*	*53*	*416560*	*8458450*	*-13.9429*	*134.2276*	*60*	*800*			*undulating*
4a	*Roper*	*Emmerugga*	*53*	*417973*	*8458678*	*-13.9409*	*134.2406*	*30*	*80*			*gully*
5a	*Roper*		*53*	*418831*	*8458840*	*-13.9395*	*134.2486*	*100*	*800*			*undulating*
5b	*Roper*		*53*	*419319*	*8458970*	*-13.9383*	*134.2531*	*10*	*100*			*creek*
5c	*Roper*		*53*	*419770*	*8458953*	*-13.9385*	*134.2573*	*95*	*550*			*creek*
6a	*A / Land*	*Emmerugga*	*53*	*421122*	*8459215*	*-13.9361*	*134.2698*	*100*	*1400*	*1*		*creek*
7a	*A / Land*	*Emmerugga*	*53*	*421988*	*8459444*	*-13.9341*	*134.2778*	*90*	*800*			*undulating*
7b	*A / Land*	*Emmerugga*	*53*	*423505*	*8459674*	*-13.9321*	*134.2919*	*50*	*800*			*creek*
8a	*A / Land*	*Emmerugga*	*53*	*425734*	*8460101*	*-13.9283*	*134.3125*	*80*	*400*			*creek*
9a	*A / Land*	*Emmerugga*	*53*	*427868*	*8460653*	*-13.9233*	*134.3323*	*50*	*1000*		*1*	*low hill*
9b	*A / Land*	*Wulkulyi*	*53*	*430239*	*8460223*	*-13.9273*	*134.3542*	*30*	*800*		*2*	*undulating*
9c	*A / Land*	*Emmerugga*	*53*	*432501*	*8461401*	*-13.9167*	*134.3752*	*30*	*400*			*creek*
9d	*A / Land*	*Favenc*	*53*	*434572*	*8461923*	*-13.9120*	*134.3944*	*40*	*1200*		*3*	*hill*
10a	*A / Land*	*Favenc*	*53*	*434550*	*8461983*	*-13.9115*	*134.3942*	*40*	*800*			*plain*
11a	*A / Land*	*Favenc*	*53*	*435345*	*8461886*	*-13.9124*	*134.4015*	*25*	*600*		*4*	*plain*
12a	*A / Land*	*Favenc*	*53*	*437853*	*8462317*	*-13.9085*	*134.4248*	*95*	*800*	*2*		*plain*
13a	*A / Land*		*53*	*441665*	*8462957*	*-13.9028*	*134.4600*	*60*	*800*			*ridge*
14a	*A / Land*		*53*	*439533*	*8462665*	*-13.9054*	*134.4403*	*70*	*800*			*creek/hill*
14b	*A / Land*		*53*	*439889*	*8462742*	*-13.9047*	*134.4436*	*95*	*800*			*gully*
15a	*A / Land*		*53*	*444203*	*8463504*	*-13.8979*	*134.4836*	*60*	*600*	*3*		*hill*
16a	*A / Land*	*Emmerugga*	*53*	*450625*	*8471887*	*-13.8222*	*134.5431*	*20*	*600*		*5*	*creek*
16b	*A / Land*		*53*	*449046*	*8471106*	*-13.8293*	*134.5285*	*92*	*400*			*creek*

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
17a	*A / Land*		*53*	*448658*	*8477107*	*-13.7750*	*134.5250*	*95*	*600*		*6*	*undulating*
18a	*A / Land*	*Emmerugga*	*53*	*455900*	*8479500*	*-13.7535*	*134.5921*	*100*	*800*	*4*	*7*	*creek*
19a	*A / Land*	*Emmerugga*	*53*	*457630*	*8483262*	*-13.7195*	*134.6081*	*80*	*600*		*8*	*creek*
20a	*A / Land*		*53*	*460344*	*8488776*	*-13.6697*	*134.6333*	*60*	*800*			*slope*
20b	*A / Land*		*53*	*461206*	*8490140*	*-13.6573*	*134.6413*	*60*	*800*			*creek*
20c	*A / Land*		*53*	*461162*	*8491695*	*-13.6433*	*134.6409*	*60*	*800*			*undulating*
21a	*A / Land*		*53*	*462143*	*8493821*	*-13.6241*	*134.6500*	*60*	*400*			*undulating*
21b	*A / Land*	*Queue*	*53*	*464688*	*8497606*	*-13.5899*	*134.6736*	*50*	*600*			*plain*
21c	*A / Land*	*Queue*	*53*	*466682*	*8502421*	*-13.5464*	*134.6921*	*65*	*400*			*undulating*
21d	*A / Land*	*Queue*	*53*	*467594*	*8504583*	*-13.5268*	*134.7005*	*80*	*400*			*creek*
21e	*A / Land*	*Queue*	*53*	*469323*	*8508105*	*-13.4950*	*134.7165*	*70*	*400*			*creek*
21f	A / Land	Levee	53	497466	8559843	-13.0273	134.9766	95	1200		9	river
22a	A / Land	Flatwood	53	494608	8549716	-13.1189	134.9503	25	400		10	creek
22b	A / Land	Flatwood	53	494842	8548771	-13.1274	134.9524	25	400			creek
22c	A / Land	Flatwood	53	496668	8544329	-13.1676	134.9693	20	600			billabong
23a	A / Land	Flatwood	53	497389	8540349	-13.2036	134.9759	20	500			creek
23b	A / Land	Flatwood	53	493790	8537561	-13.2288	134.9427	65	900			plain
23c	A / Land	Mululu	53	490468	8534688	-13.2548	134.9120	5	800			plain
24a	A / Land	Mululu	53	487778	8532618	-13.2735	134.8872	70	800		11	hill
24b	A / Land	Mululu	53	484260	8529864	-13.2984	134.8547	45	500		12	billabong
24c	A / Land	Mululu	53	480717	8527290	-13.3216	134.8219	10	600			creek
24d	A / Land	Mululu	53	479010	8525951	-13.3337	134.8062	80	500	5		hill slope/spring
24e	A / Land	Flatwood	53	476691	8523183	-13.3587	134.7847	10	800			creek
25a	*A / Land*	*Queue*	*53*	*475870*	*8521628*	*-13.3728*	*134.7771*	*10*	*800*			*creek*
25b	*A / Land*	*Queue*	*53*	*475111*	*8520154*	*-13.3861*	*134.7701*	*10*	*400*			*creek*
25c	*A / Land*	*Mululu*	*53*	*473603*	*8516359*	*-13.4204*	*134.7562*	*20*	*400*			*plain*
25d	*A / Land*	*Queue*	*53*	*473051*	*8514343*	*-13.4386*	*134.7510*	*20*	*400*			*plain*

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
25e	*A / Land*	*Queue*	*53*	*471966*	*8513530*	*-13.4460*	*134.7410*	*20*	*400*			*plain*
26a	Roper	Cliffdale	53	394034	8444592	-14.0675	134.0185	5	320	6		hill
26b	Roper	Cliffdale	53	396584	8447602	-14.0403	134.0422	10	160			rocky plain
26c	Roper	McArthur	53	398737	8449161	-14.0263	134.0622	45	600			plain
27a	Roper	Strangeways	53	387763	8440983	-14.0998	133.9603	10	400			plain
27b	Roper	Strangeways	53	381176	8437211	-14.1337	133.8991	15	400			plain
27c	Roper	Strangeways	53	377234	8435312	-14.1507	133.8625	60	800			creek
27d	Roper	Strangeways	53	376555	8435050	-14.1530	133.8562	55	200		13	creek
27e	Roper	Strangeways	53	374160	8434164	-14.1609	133.8340	80	200			hill
28a	Roper	Emmerugga	53	374136	8434182	-14.1608	133.8337	80	200			hill
28b	Roper	Emmerugga	53	372829	8433538	-14.1665	133.8216	80	200		14	plain
28c	Roper	McArthur	53	372033	8432870	-14.1725	133.8142	100	_	7		undulating
28d	Roper	Emmerugga	53	370927	8434102	-14.1613	133.8040	80	400			creek
28e	Roper	Emmerugga	53	371147	8433608	-14.1658	133.8060	10	400			ridge
29a	Roper	Suprise	53	367356	8427951	-14.2168	133.7706	100	900			b.s. plain
29b	Roper	Suprise	53	366304	8428266	-14.2139	133.7609	15	500			creek
30a	Roper	Suprise	53	368057	8457280	-13.9517	133.7785	5	600			plain
30b	Roper	Suprise	53	365118	8425700	-14.2370	133.7498	95	200			hill
30c	Roper	Bukular	53	364772	8425702	-14.2370	133.7466	75	600			ridge
31a	Roper	Munyi	53	358166	8420638	-14.2824	133.6851	100	600			hill
31b	Roper	Munyi	53	358828	8420968	-14.2795	133.6912	65	600			creek
31c	Roper	Cliffdale	53	353086	8416343	-14.3210	133.6378	35	400			rocky hills
32a	Roper	Patterson	53	349661	8413299	-14.3483	133.6058	65	400			creek
32b	Roper	Patterson	53	349658	8413298	-14.3483	133.6058	100	600			rocky slope
32c	Roper		53	349960	8411467	-14.3649	133.6085	60	800		15	creek
32d	Roper	McArthur	53	341471	8405693	-14.4166	133.5295	50	400			creek
32c	Roper	Emmerugga	53	340090	8405250	-14.4205	133.5166	80	200			creek

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
33a	Roper	Nutwood	53	339799	8403876	-14.4329	133.5139	95	400			undulating
33b	Roper	Langdon	53	334016	8399852	-14.4689	133.4600	95	600			plain
33c	Roper	Langdon	53	331960	8398900	-14.4774	133.4408	95	400			creek
34a	Roper	Langdon	53	331271	8398118	-14.4845	133.4344	95	900			plain/rise
34b	Roper	Weston	53	324857	8395723	-14.5057	133.3747	95	400		16	creek
34c	Roper	Flying Fox	53	322232	8394645	-14.5153	133.3503	95	1000		17	steep hill
34d	Roper	McArthur	53	314057	8393872	-14.5217	133.2744	55	300		18	river
35a	Roper	Siegal	53	306865	8393614	-14.5235	133.2077	30	600			plain
35b	Roper	Siegal	53	306869	8393550	-14.5241	133.2077	60	800			plain
35c	Roper	Frog	53	296483	8387456	-14.5784	133.1109	50	600			plain
35d	Roper	Frog	53	296117	8387488	-14.5781	133.1075	80	400			river
36a	Roper	Cliffdale	53	291599	8386188	-14.5895	133.0655	90	200			plain
36b	Roper	Nutwood	53	287000	8386200	-14.5891	133.0228	95	600		19	plain
36c	Roper	Ald?	53	284235	8386495	-14.5862	132.9972	90	600			plain
36d	Roper	Ald?	53	278470	8385981	-14.5903	132.9437	95	600			undulating
36e	Roper	McArthur	53	273687	8385497	-14.5943	132.8992	90	800			billabong
37a	Roper	Downs	53	271358	8385331	-14.5956	132.8776	80	400			stoney plain
37b	Roper	Downs	53	270463	8385243	-14.5963	132.8693	100	900		20a & 20b	stoney plain
37c	Roper	Claravale	53	265674	8384991	-14.5982	132.8248	85	900			plain
37d	Roper	?	53	261342	8384740	-14.6001	132.7846	85	600			plain o'crops
37e	Roper	Claravale	53	261339	8384743	-14.6001	132.7846	5	300			plain
37f	Roper	Claravale	53	252374	8384285	-14.6034	132.7014	80	400			plain
38d	Ord-Vic	Moyle	52	551847	8422245	-14.2710	129.4807	60	160			undulating
39a	Ord-Vic	Angallari	52	596969	8410167	-14.3790	129.8994	90	700			undulating
39b	Ord-Vic	Angallari	52	595509	8410523	-14.3758	129.8858	50	80			undulating
39c	Ord-Vic	Angallari	52	594534	8410583	-14.3753	129.8768	80	300			plain
39d	Ord-Vic	Moyle	52	591867	8411119	-14.3706	129.8520	70	800			plain

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
40a	Ord-Vic	Angallari	52	598425	8409985	-14.3806	129.9129	80	600			creek
40b	Ord-Vic	Angallari	52	600582	8410601	-14.3750	129.9329	90	600			b.s.plain
40c	Ord-Vic	Angallari	52	602872	8412242	-14.3600	129.9541	95	400			plain
40d	Ord-Vic	Angallari	52	603202	8412455	-14.3581	129.9571	100	400		21	creek
41a	Ord-Vic	Angallari	52	607333	8415683	-14.3288	129.9953	60	550			plain
41b	Ord-Vic	Angallari	52	610569	8418096	-14.3068	130.0252	90	600			plain
41c	Ord-Vic	Angallari	52	610570	8418100	-14.3068	130.0252	95	200			plain
41d	Ord-Vic	Angallari	52	605284	8414026	-14.3438	129.9764	40	550			creek
42a	Ord-Vic	Moyle	52	588137	8412024	-14.3625	129.8174	50	600			creek
42b	Ord-Vic	Moyle	52	587720	8412010	-14.3627	129.8136	20	80			plain
42c	Ord-Vic	Moyle	52	584355	8412766	-14.3559	129.7823	10	200			plain
42d	Ord-Vic	Moyle	52	581056	8413459	-14.3498	129.7517	10	250			plain
42e	Ord-Vic	Moyle	52	579811	8413763	-14.3471	129.7402	5	300			plain
43a	Ord-Vic	Moyle	52	577791	8414088	-14.3442	129.7214	50	200			plain
43b	Ord-Vic	Moyle	52	576906	8414320	-14.3421	129.7132	70	600			undulating
43c	Ord-Vic	Moyle	52	576900	8414325	-14.3421	129.7131	5	300			undulating
43d	Ord-Vic	Moyle	52	573411	8415951		129.6807	65	140		22	hill
44a	Ord-Vic	Moyle	52	555788	8419719	-14.2938	129.5173	65	500			plain
44b	Ord-Vic	Moyle	52	558856	8418266	-14.3069	129.5457	30	400			ridge
44c	Ord-Vic	Mullaman	52	560750	8417766	-14.3113	129.5633	80	700		23	ridge
45a	Ord-Vic	Mullaman	52	562643	8417433	-14.3143	129.5809	80	700			rocky rise
45b	Ord-Vic	Mullaman	52	563083	8417391	-14.3147	129.5849	80	300			hill
45c	Ord-Vic	Moyle	52	566768	8416492	-14.3227	129.6191	5	400			hills
46a	Tipp	Wriggley	52	752520	8396774	-14.4901	131.3428	40	800			slope
46b	Tipp	Wriggley	52	753129	8397053	-14.4876	131.3484	20	200			creek
46c	Tipp	Wriggley	52	752860	8397005	-14.4880	131.3460	70	120			creek
46d	Tipp	Wriggley	52	751259	8397099	-14.4873	131.3311	10	300			creek

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
46e	Tipp	Wriggley	52	750068	8397193	-14.4866	131.3200	50	400			creek
47a	Ord-Vic	Wriggley	52	748706	8397411	-14.4847	131.3074	75	600			plain
47b	Ord-Vic	Wriggley	52	747907	8397401	-14.4849	131.3000	70	200			rocky rise
47c	Ord-Vic	Wriggley	52	747725	8397410	-14.4848	131.2983	90	250			rocky rise
47d	Ord-Vic	Wriggley	52	744790	8398167	-14.4783	131.2710	95	700			rocky rise
47e	Ord-Vic	Wriggley	52	740162	8397428	-14.4853	131.2282	25	800			creek
48a	Ord-Vic	Pinkerton	52	729577	8396468	-14.4949	131.1301	70	600			undulating
48b	Ord-Vic	Mullaman	52	739117	8397000	-14.4893	131.2185	80	900	9, 10, 11, 12		escarpment
48c	Ord-Vic	Wingate	52	734980	8397277	-14.4872	131.1801	70	400			undulating
49a	Tipp	Wriggley	52	758130	8397791	-14.4804	131.3947	98	1000			undulating
49b	Tipp	Wriggley	52	762800	8394725	-14.5077	131.4383	90	200			undulating
49c	Tipp	Wriggley	52	764923	8394777	-14.5070	131.4580	60	70			undulating
49d	Tipp	Wriggley	52	767633	8394523	-14.5090	131.4832	5	400			undulating
49e	Tipp	Kimbyan	52	772927	8374776	-14.6869	131.5343	90	600			undulating
50a	Tipp	Kimbyan	52	774233	8394743	-14.5064	131.5443	90	400			rise
50b	Tipp	Kimbyan	52	778215	8394693	-14.5064	131.5813	60	400			undulating
50c	Tipp	Jindare	52	781481	8394727	-14.5058	131.6115	5	200			undulating
50d	Tipp	Jindare	52	781521	8394799	-14.5051	131.6119	90	200	13		hill
50e	Tipp	Banyan	52	782167	8394699	-14.5060	131.6179	85	400			river
50f	Tipp	Banyan	52	787633	8396468	-14.4894	131.6684	98	200	14	24,25,26	river
51a	Ord-Vic	Pinkerton	52	724757	8395106	-14.5076	131.0855	85	400			undulating
51b	Ord-Vic	Wingate	52	722706	8394718	-14.5113	131.0665	90	800			undulating
51c	Ord-Vic	Wingate	52	719888	8393885	-14.5191	131.0405	90	500			undulating
51d	Ord-Vic	Wingate	52	715646	8392643	-14.5306	131.0012	95	600			undulating
51e	Ord-Vic	Mullaman	52	713149	8392221	-14.5346	130.9781	95	400			gully
51f	Ord-Vic	Mullaman	52	712648	8392031	-14.5364	130.9735	95	600			hilltop
51g	Ord-Vic	Mullaman	52	712372	8391948	-14.5372	130.9709	98	80			gully

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
52a	Ord-Vic	Mullaman	52	709861	8391936	-14.5375	130.9476	5	120			undulating
54a	Tipp	Woggoman	52	792294	8394587	-14.5059	131.7118	65	400			undulating
54b	Tipp	Woggoman	52	791510	8394633	-14.5056	131.7045	45	125			undulating
54c	Tipp	Woggoman	52	791086	8394751	-14.5046	131.7006	98	150			creek
54d	Tipp	Banyan	52	788635	8394646	-14.5058	131.6779	98	400	16		river
54e	Tipp	Claravale	52	797036	8394566	-14.5056	131.7558	40	200			undulating
55a	Tipp	Claravale	52	800670	8397797	-14.4760	131.7891	60	400			undulating
55b	Tipp	Claravale	52	807168	8393397	-14.5150	131.8498	95	400			undulating
55c	Tipp	Claravale	52	808069	8392571	-14.5224	131.8583	95	100			undulating
55d	Tipp	Claravale	52	808099	8390899	-14.5375	131.8587	65	700			undulating
56a	Tipp	Banyan	53	182208	8385758	-14.5828	132.0508	45	800		27	river
56b	Tipp	Woggoman	52	814742	8390181	-14.5432	131.9204	95	1400			undulating
56c	Tipp	Beemla	52	820122	8388021	-14.5621	131.9705	60	800			undulating
56d	Tipp	Beemla	53	178554	8386574	-14.5750	132.0170	5	200			creek
57a	Tipp	Woggoman	53	190728	8385503	-14.5861	132.1298	85	400			creek
57b	Tipp	Woggoman	53	190729	8385526	-14.5859	132.1298	85	600			creek
57c	Tipp	Tagoman	53	189866	8386060	-14.5809	132.1218	90	400	17		rocky o'crop
57d	Tipp	Tagoman	53	193827	8385519	-14.5863	132.1585	90	400		28	creek
58a	Tipp	Tagoman	53	197989	8385519	-14.5867	132.1971	70	120			creek
58b	Tipp	Tagoman	53	198049	8385581	-14.5862	132.1976	95	600	18		creek
58c	Tipp	Tagoman	53	198199	8385562	-14.5864	132.1990	95	400		29	slope/o'crop
59a	Tipp	Tagoman	53	199939	8385200	-14.5898	132.2151	95	600	19		creek
59b	Tipp	Tagoman	53	200584	8385603	-14.5863	132.2212	90	400		30	terrace
59c	Tipp	Tagoman	53	201046	8385375	-14.5884	132.2254	98	280		31	terrace
59d	Tipp	Tagoman	53	201251	8385172	-14.5902	132.2273	15	500		32	ridge
59e	Tipp	Tagoman	53	202444	8385486	-14.5875	132.2384	50	400		33	terrace
59f	Tipp	Yujullowan	53	203101	8385519	-14.5873	132.2445	90	600		34	ridge

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
59g	Tipp	Kimbyan	53	203240	8385550	-14.5870	132.2458	10	600		35	plain
60a	Tipp	Kimbyan	53	204317	8385494	-14.5877	132.2558	10	500			plain
60b	Tipp	Kimbyan	53	205065	8385815	-14.5849	132.2627	5	340			plain
60c	Tipp	Kimbyan	53	205678	8385524	-14.5875	132.2684	10	700			plain
60d	Tipp	Tagoman	53	210152	8384613	-14.5963	132.3098	50	800		36	ridge
60e	Tipp	Tagoman	53	211961	8384171	-14.6004	132.3265	98	600		37	creek
61a	Tipp	Kimbyan	53	215592	8383169	-14.6099	132.3601	5	400			plain
61b	Tipp	Kimbyan	53	219497	8382191	-14.6191	132.3962	75	400	20		creek
62a	Tipp	Kimbyan	53	222338	8382012	-14.6210	132.4225	5	400			undulating
62b	Tipp	Kimbyan	53	225043	8381969	-14.6217	132.4476	98	240		38	creek
62c	Tipp	Kimbyan	53	225990	8381800	-14.6233	132.4564	90	400		39	slope
62d	Tipp	Wallingin	53	226091	8381820	-14.6231	132.4573	95	300	21		creek
62e	Tipp	Wallingin	53	226109	8352079	-14.8918	132.4544	5	260			undulating
62f	Tipp	Wallingin	53	228908	8382297	-14.6191	132.4835	5	100			plain
62g	Tipp	Wallingin	53	229552	8382305	-14.6191	132.4895	90	600	22		creek
63a	Tipp	Blain	53	234189	8382724	-14.6158	132.5325	5	560			plain
63b	Tipp	Blain	53	238145	8383132	-14.6125	132.5693	15	200			plain
63c	Tipp	Blain	53	238760	8383285	-14.6112	132.5750	15	400	23		plain
64a	Roper	Blain	53	239065	8383432	-14.6099	132.5778	50	240			undulating
64b	Roper	Woggoman	53	244177	8383628	-14.6086	132.6253	50	800			creek
65a	Roper	Woggoman	53	244235	8383028	-14.6140	132.6258	20	800		40	creek
65b	Roper	Yungman	53	247332	8383938	-14.6061	132.6546	40	800		41	creek
66a	A / Land	Queue	53	574926	8597331	-12.6874	135.6901	85	800			creek
66b	A / Land	Keating	53	575626	8597569	-12.6853	135.6965	5	400			billabong
66c	A / Land	Queue	53	579386	8597435	-12.6864	135.7311	40	400			undulating
66d	A / Land	Queue	53	584474	8597083	-12.6894	135.7780	35	640		42	undulating
67a	A / Land	Queue	53	589604	8596802	-12.6918	135.8253	85	800		43	creek

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
67b	A / Land	Keefer Hut	53	593389	8596711	-12.6925	135.8601	90	60			creek
67c	A / Land	Kay	53	594280	8596715	-12.6925	135.8683	80	800			undulating
67d	A / Land	Effington	53	596626	8596439	-12.6949	135.8899	80	500			plain
67e	A / Land	Kay	53	598821	8596419	-12.6950	135.9102	85	700			plain
67f	A / Land	Kay	53	599617	8596062	-12.6982	135.9175	80	360			plain
67g	A / Land	Kay	53	601161	8596235	-12.6966	135.9317	80	200			plain
67h	A / Land	Kay	53	603400	8596128	-12.6975	135.9523	85	960			undulating
67i	A / Land	Keating	53	603583	8596067	-12.6980	135.9540	90	120			creek
67j	A / Land	Goromuru	53	608333	8596076	-12.6978	135.9978	90	600		44	hill
68a	A / Land	Kay	53	614351	8595629	-12.7016	136.0532	70	1100			undulating
68b	A / Land	Keating	53	616350	8595460	-12.7031	136.0716	90	200	24		creek
68c	A / Land	Keating	53	618540	8595483	-12.7028	136.0918	85	400		45	undulating
68d	A / Land	Keating	53	618880	8595231	-12.7051	136.0949	70	200			creek
68e	A / Land	Goromuru	53	621739	8595204	-12.7052	136.1213	20	470			creek
68f	A / Land	Keating	53	622573	8595260	-12.7046	136.1289	20	800			creek
68g	A / Land	Keating	53	625766	8595020	-12.7067	136.1583	10	220			plain
68h	A / Land	Goromuru	53	626939	8595032	-12.7065	136.1691	40	600			plain
68i	A / Land	Goromuru	53	627785	8594927	-12.7075	136.1769	5	200			billabong
68j	A / Land	Keating	53	628859	8593359	-12.7216	136.1869	5	700			creek
69a	A / Land	Keating	53	628709	8593358	-12.7216	136.1855	5	400			creek
69b	A / Land	Keating	53	629113	8594593	-12.7104	136.1892	15	400			creek
69c	A / Land	Keating	53	631481	8594792	-12.7085	136.2110	30	800			undulating
69d	A / Land	Keating	53	631492	8594919	-12.7074	136.2111	5	400			undul/swampy
69e	A / Land	Kay	53	634885	8597427	-12.6846	136.2422	30	960			creek
69f	A / Land	Efffington	53	639015	8600815	-12.6537	136.2801	5	120			plain
69g	A / Land	Efffington	53	639333	8600166	-12.6596	136.2830	5	1100		46	creek
69h	A / Land	Efffington	53	639386	8601192	-12.6503	136.2835	5	3600			creek

Transect	Region	L / System	Zone	Easting	Northing	Lat	Long	Av. Vis.%	Transect length (m)	Sites	B.S	Terrain
70a	A / Land	Efffington	53	685616	8633141	-12.3591	136.7072	5	360			undulating
70b	A / Land	Klatt	53	687387	8634924	-12.3429	136.7233	30	1000			hill
70c	A / Land	Giddy	53	688667	8636302	-12.3304	136.7350	90	880		47	ridge
70d	A / Land	Giddy	53	699475	8636998	-12.3234	136.8343	90	200			plain
70e	A / Land	Giddy	53	691645	8639225	-12.3038	136.7622	5	1200			creek
70f	A / Land	Giddy	53	691929	8639539	-12.3009	136.7648	5	800			creek

Details of pedestrian transects 2004

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
1	A / Land	Mululu	-13.4361	134.5716	53	453626	8514597	95	800			undulating
2	A / Land	Mululu	-13.4617	134.5849	53	455070	8511768	75	700			undulating
3a	A / Land	Flatwood	-13.4844	134.6093	53	457715	8509262	10	500			undulating
3b	A / Land	Flatwood	-13.4876	134.617	53	458549	8508909	10	400			creek
4a	A / Land	Mululu	-13.4706	134.6387	53	460895	8510793	70	800			plain
4b	A / Land	Mululu	-13.4555	134.6579	53	462971	8512466	75	600			plain
4c	A / Land	Flatwood		134.6678	53	464041	8513518	75	900	26, 27	49	creek
4d	A / Land	Flatwood	-13.4398	134.6733	53	464635	8514204	75	80		50	plain
4e	A / Land	Mululu	-13.4276	134.6888	53	466312	8515556	40	800			plain
4f	A / Land	Mululu	-13.4192	134.6984	53	467350	8516486	40	900			plain
4g	A / Land	Mululu	-13.4153	134.703	53	467847	8516918	40	300			plain
4h	A / Land	Mululu	-13.4070	134.713	53	468929	8517837	60	660			creek
4i	A / Land	Mululu	-13.3959	134.7261	53	470346	8519066	60	550			plain
4j	A / Land	Mululu	-13.3877	134.7361	53	471427	8519974	10	700			b/s/plain
4k	A / Land	Mululu	-13.4028	134.7165	53	469307	8518302	60	200			plain
5a	A / Land	Queue	-13.4555	134.6799	53	465352	8512469	60	800			plain/ridges
5b	A / Land	Queue	-13.4875	134.6187	53	458733	8508920	50	250			swamp
5c	A / Land	Queue	-13.4862	134.6174	53	458592	8509064	10	200			creek
5d	A / Land	Flatwood	-13.4975	134.6073	53	457501	8507813	80	1060			plain
5e	A / Land	Queue	-13.5242	134.5769	53	454216	8504854	35	1100			billabong
5f	A / Land	Horse Creek	-13.5369	134.562	53	452606	8503447	5	140			creek
5g	A / Land	Emmerugga	-13.5504	134.5462	53	450900	8501951	25	1150			creek
5h	A / Land	Emmerugga	-13.5568	134.5385	53	450068	8501241	25	600			creek

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
5i	A / Land	Horse Creek	-13.5742	134.519	53	447962	8499313	35	200			plain
5j	A / Land	Horse Creek	-13.5768	134.5151	53	447540	8499025	70	750			plain/ridges
6a	A / Land	Emmerugga	-13.5937	134.4947	53	445337	8497151	60	900			small hills
6b	A / Land	Emmerugga	-13.5996	134.489	53	444722	8496497	50	350			undulating
6c	A / Land	Emmerugga	-13.6163	134.47	53	442670	8494646	25	450			ridge
6d	A / Land	Emmerugga	-13.6207	134.4644	53	442066	8494158	30	200			hill
7a	A / Land	Emmerugga	-13.6246	134.4608	53	441677	8493726	40	800			undulating
7b	A / Land	Emmerugga	-13.6473	134.4332	53	438698	8491208	40	900			undulating
7c	A / Land	Cliffdale	-13.6538	134.426	53	437921	8490488	5	200			undulating
7d	A / Land	Cliffdale	-13.6602	134.4174	53	436992	8489778	30	80			creek
7e	A / Land	Cliffdale	-13.6657	134.4111	53	436312	8489168	15	80			undulating
7f	A / Land	Cliffdale	-13.6733	134.4034	53	435482	8488325	80	800			creek
7g	A / Land	Favenc	-13.6795	134.3933	53	434391	8487637	5	200			steep hill
7h	A / Land	Favenc	-13.6918	134.3813	53	433097	8486273	10	1100			river
7i	A / Land	McArthur	-13.6936	134.3825	53	433227	8486074	15	1350		51	river
8a	A / Land	Emmerugga	-13.7124	134.3619	53	431005	8483989	100	200	29		river
8b	A / Land	Emmerugga	-13.7209	134.3538	53	430132	8483047	80	900			creek/hill
8c	A / Land	Flying Fox	-13.7419	134.3336	53	427954	8480718	95	900			plains
9a	A / Land	Flying Fox	-13.7556	134.32	53	426488	8479199	5	160			creek
9b	A / Land	Flying Fox	-13.7700	134.3036	53	424719	8477601	40	1000			plain/o'crop
9c	A / Land	Flying Fox	-13.7895	134.28	53	422175	8475437	80	160		52	creek
9d	A / Land	Lindsay/Coolibah	-13.7913	134.2784	53	422002	8475238	50	750			creek
10a	Roper	Lindsay/Coolibah	-13.8190	134.2451	53	418412	8472163	5	800			plains
10b	Roper	Lindsay/Coolibah	-13.8241	134.2391	53	417766	8471597	60	400		53	creek
10c	Roper	Lindsay/Coolibah	-13.8434	134.2242	53	416162	8469457	80	300			plain/o'crop
10d	Roper	Lindsay/Coolibah	-13.8406	134.219	53	415599	8469765	90	350	30		plain/o'crop

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
11	Roper	Lindsay/Coolibah	-13.8760	134.1793	53	411322	8465835	50	800	31		creek
11a	Roper	Lindsay/Coolibah	-13.8764	134.1771	53	411084	8465790	10	340		54	creek
11b	Roper	Lindsay/Coolibah	-13.8762	134.418	53	437115	8465889	100	160	32		creek
11c	Roper	Lindsay/Coolibah	-13.8772	134.164	53	409669	8465697	5	160			creek
11d	Roper	Cliffdale	-13.8848	134.1716	53	410493	8464859	5	400		55	plain
11e	Roper	Cliffdale	-13.8878	134.167	53	409997	8464525	40	800		56	creek
12a	Roper	Cliffdale	-13.9030	134.1597	53	409215	8462841	5	300			plain
12b	Roper	Patterson	-13.9130	134.1535	53	408549	8461733	10	110			plain
12c	Roper	Cliffdale	-13.9208	134.1483	53	407990	8460868	5	700			hill
12d	Roper	Strangeways	-13.9424	134.1422	53	407339	8458477	90	600		57	creek
12e	Roper	Cliffdale	-13.9511	134.1403	53	407138	8457514	100	40			creek
12f	Roper	Cliffdale	-13.9563	135.1288	53	513912	8457103	0	350			creek
12g	Roper	Cliffdale	-13.9798	134.1491	53	408100	8454343	5	200			floodplain
13	Roper	Strangeways	-14.1046	133.9476	53	386396	8440451	85	600			ridge/plain
13a	Roper	Strangeways	-14.1067	133.9367	53	385221	8440214	85	600			low ridge
13b	Roper	Strangeways	-14.1140	133.9482	53	386466	8439412	85	700			undulating
14	Roper	McArthur	-14.1227	133.939	53	385477	8438445	5	200			creek
14a	Roper	McArthur	-14.1241	133.9382	53	385391	8438290	0	200			creek
14b	Roper	McArthur	-14.1364	133.9248	53	383951	8436922	5	700		58	slope
14c	Roper	McArthur	-14.1375	133.9225	53	383703	8436800	5	800		59	creek
14d	Roper	McArthur	-14.1388	133.9181	53	383229	8436654	90	500		60	creek
14f	Roper	McArthur	-14.1552	133.906	53	381931	8434834	50	800			undulating
14g	Roper	Cliffdale	-14.1714	133.9004	53	381335	8433039	40	1100			creek
14h	Roper	McArthur	-14.1734	133.8847	53	379642	8432810	5	800			undulating
14i	Roper	Bukalar	-14.1834	133.8758	53	378687	8431699	95	800		61	undulating
14j	Roper	Bukalar	-14.1992	133.8597	53	376958	8429943	95	500			creek

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
14k	Roper	Bukalar	-14.1974	133.8546	53	376406	8430139	60	1600			hills
15a	Roper	Munyi	-14.2104	133.8469	53	375583	8428697	95	680			undulating
15b	Roper	Munyi	-14.2100	133.8427	53	375129	8428739	95	300			undulating
15c	Roper	Munyi	-14.2180	133.8381	53	374637	8427852	75	300			creek/slope
15d	Roper	Munyi	-14.2243	133.8321	53	373993	8427151	45	700			plain
15e	Roper	Bukalar	-14.2306	133.8259	53	373328	8426451	45	800			creek/slope
16a	Roper	Bukalar	-14.2412	133.8153	53	372190	8425273	25	200			plain
16b	Roper	Lindsay	-14.2456	133.8096	53	371577	8424783	20	80			plain
16c	Roper	Suprise	-14.2525	133.8038	53	370955	8424016	70	800		62	plain
16d	Roper	Lindsay	-14.2544	133.8011	53	370665	8423805	10	400			creek
16e	Roper	Suprise	-14.2637	133.7939	53	369894	8422772	15	200			creek
18	Roper	Suprise	-14.2849	133.7752	53	367889	8420416	5	700			undulating
18a	Roper	Bukalar	-14.3035	133.7821	53	368644	8418363	5	200			creek
18b	Roper	Siegal	-14.3019	133.7594	53	366194	8418527	95	2200			ridge
19a	Roper	Suprise	-14.2867	133.7733	53	367685	8420216	90	1100			creek
19b	Roper	Siegal	-14.3244	133.7303	53	363069	8416021	5	300			creek
19c	Roper	Siegal	-14.3257	133.7254	53	362541	8415874	5	2600			creek
19d	Roper	McArthur	-14.3387	133.693	53	359054	8414416	5	600			undulating
19e	Roper	McArthur	-14.4329	133.6861	53	358370	8403991	40	750			creek/slope
19f	Roper	McArthur	-14.3492	133.6785	53	357497	8413246	5	700			hill
19g	Roper	McArthur	-14.2867	133.6704	53	356584	8420155	5	80			ridge
19h	Roper	McArthur	-14.3543	133.6691	53	356487	8412676	5	300			creek
19i	Roper	McArthur	-14.3618	133.6598	53	355488	8411841	50	900			creek
19j	Roper	McArthur	-14.3602	133.653	53	354754	8412013	50	400			creek
19k	Roper	McArthur	-14.3579	133.6441	53	353793	8412262	40	600			creek
20	Roper	Nutwood	-14.3849	133.6278	53	352053	8409265	20	700			plain

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
20a	Roper	Langdon	-14.3919	133.621	53	351324	8408486	5	200			slope
20b	Roper	Langdon	-14.3953	133.6133	53	350496	8408105	50	800			low hill
20c	Roper	McArthur	-14.4022	133.6063	53	349746	8407337	40	350			creek
20d	Roper	McArthur	-14.4052	133.598	53	348853	8407000	30	200			creek
20e	Roper	Coolibah	-14.4194	133.5785	53	346760	8405416	25	1200			hill
20f	Roper	Suprise	-14.4307	133.5574	53	344493	8404152	5	400			creek
20g	Roper	Emmerugga	-14.4333	133.5568	53	344430	8403864	95	600			floodplain
20h	Roper	Suprise	-14.4399	133.5522	53	343938	8403130	10	200			creek
20i	Roper	Suprise	-14.4466	133.54	53	342628	8402381	0	300			creek
21a	Roper	Emmerugga	-14.4558	133.5264	53	341168	8401354	20	150		63	ridge
21b	Roper	Emmerugga	-14.4637	133.5146	53	339902	8400471	5	400			creek
21c	Roper	Emmerugga	-14.4666	133.5096	53	339365	8400147	50	400		64	creek
21d	Roper	Suprise	-14.4716	133.5054	53	338915	8399591	30	1700			creek/hill
21e	Roper	Suprise	-14.4743	133.4892	53	337171	8399281	5	140			undulating
21f	Roper	Suprise	-14.4751	133.4768	53	335835	8399183	5	200			creek
21g	Roper	Langdon	-14.4747	133.4648	53	334541	8399219	5	700			plain
22a	Tipperary	Tagoman	-14.5857	132.1744	53	195541	8385605	50	260			creek
22b	Tipperary	Tagoman	-14.5860	132.1683	53	194884	8385564	35	1000			undulating
22c	Tipperary	Tagoman	-14.5862	132.1717	53	195251	8385546	35	800		65	creek
22d	Tipperary	Tagoman	-14.5828	132.173	53	195386	8385924	35	800		66	undulating
22e	Tipperary	Tagoman	-14.5829	132.1683	53	194880	8385907	50	900			undulating
23a	Tipperary	Blain	-14.6138	132.552	53	236285	8382967	5	100			undulating
23b	Tipperary	Blain	-14.6143	132.5506	53	236135	8382910	5	1000			undulating
23c	Tipperary	Blain	-14.6099	132.55	53	236065	8383396	5	1000			undulating
23d	Tipperary	Blain	-14.6095	132.5544	53	236538	8383445	5	1000			undulating
24	Ord-Vic	Mullaman	-14.4850	131.2329	52	740672	8397461	90	8000	35,36	67	hills/creek

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
25	Ord-Vic	Wingate	-14.4920	131.2182	52	739079	8396701	90	800			undulating
26	Ord-Vic	Wingate	-14.4871	131.2089	52	738082	8397253	90	700		68	undulating
28a	Ord-Vic	Wingate	-14.5341	130.9288	52	707837	8392325	95	1200			undulating
28b	Ord-Vic	Wingate	-14.5250	130.886	52	703232	8393371	95	1400			undulating
28c	Ord-Vic	Wingate	-14.5166	130.8398	52	698260	8394341	70	1300			undulating
28d	Ord-Vic	Wingate	-14.5120	130.8193	52	696054	8394868	70	800			undulating
28e	Ord-Vic	Mullaman	-14.5083	130.7985	52	693815	8395295	50	1200			undulating
29a	Ord-Vic	Mullaman	-14.5075	130.796	52	693546	8395385	80	200			low ridge
29b	Ord-Vic	Mullaman	-14.4976	130.7884	52	692735	8396487	20	1000			swamp
29c	Ord-Vic	Mullaman	-14.4923	130.7893	52	692837	8397073	20	60			rocky slope
29d	Ord-Vic	Mullaman	-14.4855	130.7833	52	692196	8397830	20	1100			undulating
30a	Ord-Vic	Wingate	-14.4634	130.7731	52	691115	8400284	95	1000			undulating
30b	Ord-Vic	Wingate	-14.4653	130.769	52	690672	8400077	95	1000			undulating
30c	Ord-Vic	Wingate	-14.4614	130.7674	52	690503	8400510	95	1000			undulating
30d	Ord-Vic	Wingate	-14.4595	130.7713	52	690925	8400717	95	1000			undulating
31	Ord-Vic	Wingate	-14.4624	130.7732	52	691127	8400395	95	800			undulating
31a	Ord-Vic	Wingate	-14.4228	130.7546	52	689155	8404792	85	800			undulating
31b	Ord-Vic	Wingate	-14.4128	130.7134	52	684721	8405932	10	800			undulating
31c	Ord-Vic	Wingate	-14.4072	130.6692	52	679959	8406586	25	1700		69	undulating
31d	Ord-Vic	Wingate	-14.4051	130.6234	52	675021	8406854	30	1000			undulating
31e	Ord-Vic	Wingate	-14.4039	130.5903	52	671453	8407012	5	200			swamp
31f	Ord-Vic	Wingate	-14.4050	130.5873	52	671129	8406892	50	600		70	swamp
31g	Ord-Vic	Wingate	-14.4082	130.2852	52	638552	8406741	10	400			swamp
31h	Ord-Vic	Wingate	-14.4115	130.5847	52	670843	8406175	20	200		71	swamp
31i	Ord-Vic	Wingate	-14.4208	130.5791	52	670232	8405150	30	400			swamp
31j	Ord-Vic	Wingate	-14.4430	130.5684	52	669062	8402702	30	800			swamp

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
31k	Ord-Vic	Wingate	-14.4439	130.5669	52	668899	8402603	50	800		72	swamp
31l	Ord-Vic	Wingate	-14.4371	130.5539	52	667503	8403365	50	1200			undulating
32a	Ord-Vic	Wingate	-14.4067	130.5215	52	664032	8406752	40	1300			undulating
32b	Ord-Vic	Wingate	-14.4036	130.5179	52	663646	8407097	40	400			undulating
32c	Ord-Vic	Wingate	-14.3981	130.5143	52	663262	8407709	40	400			undulating
32d	Ord-Vic	Wingate	-14.3339	130.5006	52	661831	8414821	4	400			undulating
32e	Ord-Vic	Wingate	-14.3920	130.4991	52	661627	8408394	40	200			undulating
32f	Ord-Vic	Wingate	-14.3798	130.4929	52	660967	8409748	25	800			undulating
32g	Ord-Vic	Wingate	-14.3714	130.477	52	659258	8410688	5	200			undulating
32h	Ord-Vic	Wingate	-14.3629	130.4547	52	656859	8411644	30	1000			undulating
32i	Ord-Vic	Wingate	-14.3509	130.422	52	653341	8412994	20	400			creek
32j	Ord-Vic	Wingate	-14.3474	130.4116	52	652222	8413388	60	1000		73	creek
33	Ord-Vic	Wingate	-14.3382	130.4085	52	651893	8414408	25	5400	37,38		creek
34a	Ord-Vic	Wingate	-14.3343	130.3775	52	648552	8414859	60	600		74	creek
34b	Ord-Vic	Wingate	-14.3424	130.3807	52	648892	8413961	15	60			swamp
34c	Ord-Vic	Wingate	-14.3477	130.3821	52	649040	8413374	60	160			swamp
34d	Ord-Vic	Wingate	-14.3528	130.3852	52	649371	8412808	60	120			swamp
34e	Ord-Vic	Wingate	-14.3405	130.3642	52	647114	8414182	60	550			undulating
34d	Ord-Vic	Wingate	-14.3204	130.3497	52	645563	8416414	60	1800	39		creek
35a	Ord-Vic	Wingate	-14.3192	130.3514	52	645747	8416546	50	1000		75	creek
35b	Ord-Vic	Wingate	-14.3174	130.3298	52	643418	8416759	40	400			undulating
35c	Ord-Vic	Wingate	-14.3114	130.3217	52	642548	8417427	40	1100			undulating
35d	Ord-Vic	Pinkerton	-14.2958	130.269	52	636873	8419185	45	900			undulating
35e	Ord-Vic	Wingate	-14.2718	130.2489	52	634719	8421852	60	2400	40		creek
36a	Ord-Vic	Wingate	-14.2864	130.2316	52	632844	8420247	60	900			undulating
36b	Ord-Vic	Wingate	-14.2835	130.2132	52	630861	8420578	40	1600		76	creek

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
37	Ord-Vic	Pinkerton	-14.2735	130.1713	52	626346	8421707	45	450		77	undulating
37a	Ord-Vic	Pinkerton	-14.2644	130.1277	52	621648	8422737	25	900			undulating
37b	Ord-Vic	Pinkerton	-14.2627	130.1137	52	620138	8422932	10	400			ridges
37c	Ord-Vic	Pinkerton	-14.2616	130.0958	52	618208	8423063	10	800			steep hill
38	Ord-Vic	Pinkerton	-14.2614	130.0851	52	617053	8423091	30	700			hill
38a	Ord-Vic	Pinkerton	-14.2730	130.0805	52	616551	8421810	70	200			creek
38b	Ord-Vic	Pinkerton	-14.2748	130.0695	52	615363	8421616	80	300			creek
38c	Ord-Vic	Pinkerton	-14.2760	130.067	52	615093	8421485	80	1200		78	creek
38d	Ord-Vic	Pinkerton	-14.2888	130.5006	52	661863	8419810	95	600			creek
38e	Ord-Vic	Pinkerton	-14.2857	130.0521	52	613481	8420419	80	300			creek
38f	Ord-Vic	Pinkerton	-14.2806	130.0538	52	613667	8420983	50	600			steep hill
39a	A / Land	Giddy	-12.3639	136.6995	53	684779	8632620	15	500			undulating
39b	A / Land	Giddy	-12.3881	136.6641	53	680912	8629967	35	1000			undulating
39c	A / Land	Giddy	-12.3861	136.6267	53	676847	8630213	80	1200			undulating
39d	A / Land	Giddy	-12.3899	136.6203	53	676148	8629797	80	400			creek
40a	A / Land	Cato	-12.4626	136.5432	53	667718	8621805	30	800			undulating
41a	A / Land	Gove	-12.4676	136.5483	53	668269	8621248	25	600		79	stoney hill
41b	A / Land	Keefers Hut	-12.4597	136.536	53	666937	8622130	30	450			undulating
41c	A / Land	Keefers Hut	-12.4661	136.5321	53	666509	8621424	70	300			creek
41d	A / Land	Keefers Hut	-12.4814	136.5185	53	665021	8619740	70	200			creek
41e	A / Land	Keefers Hut	-12.4862	136.5135	53	664475	8619213	50	300			creek
41f	A / Land	Keefers Hut	-12.4899	136.511	53	664200	8618805	5	800			swamp dry
41g	A / Land	Keefers Hut	-12.5049	136.4984	53	662822	8617153	50	200			creek
41h	A / Land	Effington	-12.5097	136.4936	53	662297	8616625	50	450			creek
41i	A / Land	Effington	-12.5126	136.4987	53	662849	8616301	70	500			gully
42a	A / Land	Kay	-12.6070	136.4056	53	652675	8605915	70	1200			undulating

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
42b	A / Land	Kay	-12.6214	136.3843	53	650353	8604335	50	1100			gentle slope
42c	A / Land	Kay	-12.6300	136.3611	53	647828	8603397	40	100			plain
42d	A / Land	Kay	-12.6327	136.3526	53	646903	8603103	50	100			plain
42e	A / Land	Kay	-12.6355	136.3442	53	645989	8602798	50	1600			undulating
42f	A / Land	Kay	-12.6430	136.3236	53	643747	8601980	5	60			floodplain
42g	A / Land	Kay	-12.6457	136.315	53	642811	8601686	50	100			plain
42h	A / Land	Keating	-12.6502	136.3051	53	641734	8601193	40	200			creek
42i	A / Land	Keating	-12.6522	136.6977	53	684378	8600727	80	1300			stony hill
42j	A / Land	Effington	-12.6539	136.292	53	640309	8600791	15	500			creek
42k	A / Land	Effington	-12.6539	136.2922	53	640330	8600791	10	1600			creek
43a	A / Land	Kay	-12.5753	136.4379	53	656204	8609403	30	1400			plain
43b	A / Land	Effington	-12.5648	136.4477	53	657275	8610558	5	1600			billabongs
44a	A / Land	Giddy	-12.2999	136.7659	53	692047	8639653	20	1000			river
44b	A / Land	Giddy	-12.2981	136.7681	53	692288	8639851	5	300			plain
44c	A / Land	Cato	-12.2831	136.7822	53	693832	8641500	30	800			ridge
44d	A / Land	Cato	-12.2800	136.7848	53	694118	8641841	40	1100			ridge
44e	A / Land	Giddy	-12.2755	136.7877	53	694436	8642337	5	450			undulating
44f	A / Land	Giddy	-12.2407	136.7882	53	694516	8646186	60	1200			undulating
44g	A / Land	Giddy	-12.2350	136.7893	53	694640	8646816	5	300			creek
45a	A / Land	Giddy	-12.3947	136.6144	53	675504	8629270	5	1100			undulating
45b	A / Land	Cato	-12.3981	136.6074	53	674740	8628898	10	400			creek
45c	A / Land	Gove	-12.3993	136.5991	53	673837	8628771	5	1200			undulating
45d	A / Land	Cato	-12.4027	136.572	53	670888	8628412	5	1000			low ridges
45e	A / Land	Cato	-12.4053	136.5658	53	670212	8628129	45	400			ridge
45f	A / Land	Cato	-12.4072	136.5623	53	669830	8627921	45	600			ridge
46a	A / Land	Giddy	-12.2195	136.7882	53	694532	8648532	80	100			undulating

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
46b	A / Land	Giddy	-12.1946	136.7489	53	690273	8651314	15	100			undulating
46c	A / Land	Giddy	-12.1934	136.7377	53	689055	8651455	5	80			undulating
47a	A / Land	Queue	-12.6896	135.6875	53	574647	8597091	90	200		80	creek
47b	A / Land	Queue	-12.6841	135.6882	53	574724	8597700	5	800			creek
47c	A / Land	Queue	-12.6821	135.6625	53	571934	8597928	95	500		81	hill
47d	A / Land	Mitchell	-12.6907	135.6527	53	570868	8596980	20	1000			slope
47e	A / Land	Durabudboi	-12.7003	135.6429	53	569801	8595920	40	400			slope
47d	A / Land	Mitchell	-12.7141	135.6086	53	566073	8594403	10	1200			undulating
48a	A / Land	Keating	-12.6935	135.7023	53	576252	8596656	20	400			creek
48b	A / Land	Keating	-12.7004	135.7071	53	576772	8595891	5	400			undulating
49	A / Land	Queue	-12.6173	135.8185	53	588896	8605046	60	1200		82	creek
49a	A / Land	Queue	-12.8903	135.3946	53	542810	8574963	85	1500			undulating
49b	A / Land	Queue	-12.9237	135.3632	53	539398	8571274	60	300			undulating
49c	A / Land	Queue	-12.9296	135.3577	53	538801	8570622	40	1200			undulating/hill
49d	A / Land	Queue	-12.9618	135.3481	53	537754	8567063	50	700			creek
50a	A / Land	Queue	-12.9963	135.3225	53	534973	8563251	60	900			undulating
50b	A / Land	Queue	-13.0218	135.2886	53	531294	8560436	85	1360			undulating
50c	A / Land	Queue	-13.0489	135.2522	53	527344	8557443	60	1400			undulating
50d	A / Land	Queue	-13.0825	135.2045	53	522169	8553732	35	1000			plain
50e	A / Land	Queue	-13.0895	135.1886	53	520445	8552959	50	1700			lake
50f	A / Land	Queue	-13.0956	135.1814	53	519664	8552285	50	200			undulating
50g	A / Land	Mululu	-13.0999	135.1683	53	518243	8551811	90	40			undulating
50h	A / Land	Mululu	-13.1015	135.1641	53	517788	8551634	80	1400			plain
50i	A / Land	Mululu	-13.1039	135.1597	53	517311	8551369	80	100			plain
50j	A / Land	Mululu	-13.1082	135.1484	53	516086	8550894	50	800			creek
50k	A / Land	Queue	-13.1163	135.1233	53	513365	8550000	65	1400			undulating

Transect	Region	L / System	LAT	LONG	Zone	Easting	Northing	Av. Vis. %	Trans.length (m)	Sites	B.S	Terrain
50l	A / Land	Levee	-13.1238	135.1045	53	511326	8549171	30	1200		83	river

Appendix 4
Details of the individual historic and archaeological sites

Site 1.
Stone Arrangement 1.

Location: 53 421122E 8459215N Marumba 5770 1.100,000 map sheet
-13.9361°S 134.2698°E

Land System: Emmerugga

Geomorphic Context: Stony rise

Method of Discovery: Vehicle transect.

Ground surface visibility %: Maximum-100%, Minimum_90%. Average-95%

Site location: The site is located approximately two kilometres east of the border between Arnhem Land and Mainoru Station on a gently stony slope next to an ephemeral creek. The area is covered in open woodland with skeletal soils.

Site description: There are two stone arrangement each consisting of a large narrow sandstone slab resting on small stacks of rocks and termite mounds. The Aboriginal informants said they were 'barbeque plates' and were used by buffalo hunters in the late 1990s. The stone slabs are approximately 1 x 0.8 metres and the two 'plates' are two metres apart.

Relationship to proposed pipeline: Site 1 is 12 kilometres south of the proposed pipeline and will not be disturbed by the development.

*Significance**:*** While these stone arrangements may have been recently constructed they represent a novel use of stone and if, as the Traditional owners stated, they were used as cooking plates they represent a way of life, no longer practiced or in danger of being lost Therefore the site has a historic significance.

Site 2.
Stone Artefact Scatter 1

Location: 52 437891E 8462346N Marumba 5770 1:100,000 map sheet
-13.9082°S 8462346°E

Land System: McArthur

Geomorphic Context: Black soil plain

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-90%. Average-95%

Site location: The site is located 300 metres west of the Wilton River in an area of small levee banks and cracking soil flats. It is 10 metres east of a track that runs parallel to the river. The area has been disturbed by cattle and is vegetated by closed low woodland.

Site description: The small stone artefact scatter is located on the side of a low levee bank and consists of unretouched flakes, one core and one flaked piece all made from a pale red brown siltstone, These artefacts are concentrated in one small area. Within 10 metres of the scatter were one core and two flakes made from the same material. The flakes have an average length of 50 mm. It appears that large flakes are being removed from cores, however none of the flakes could be conjoined to the cores.

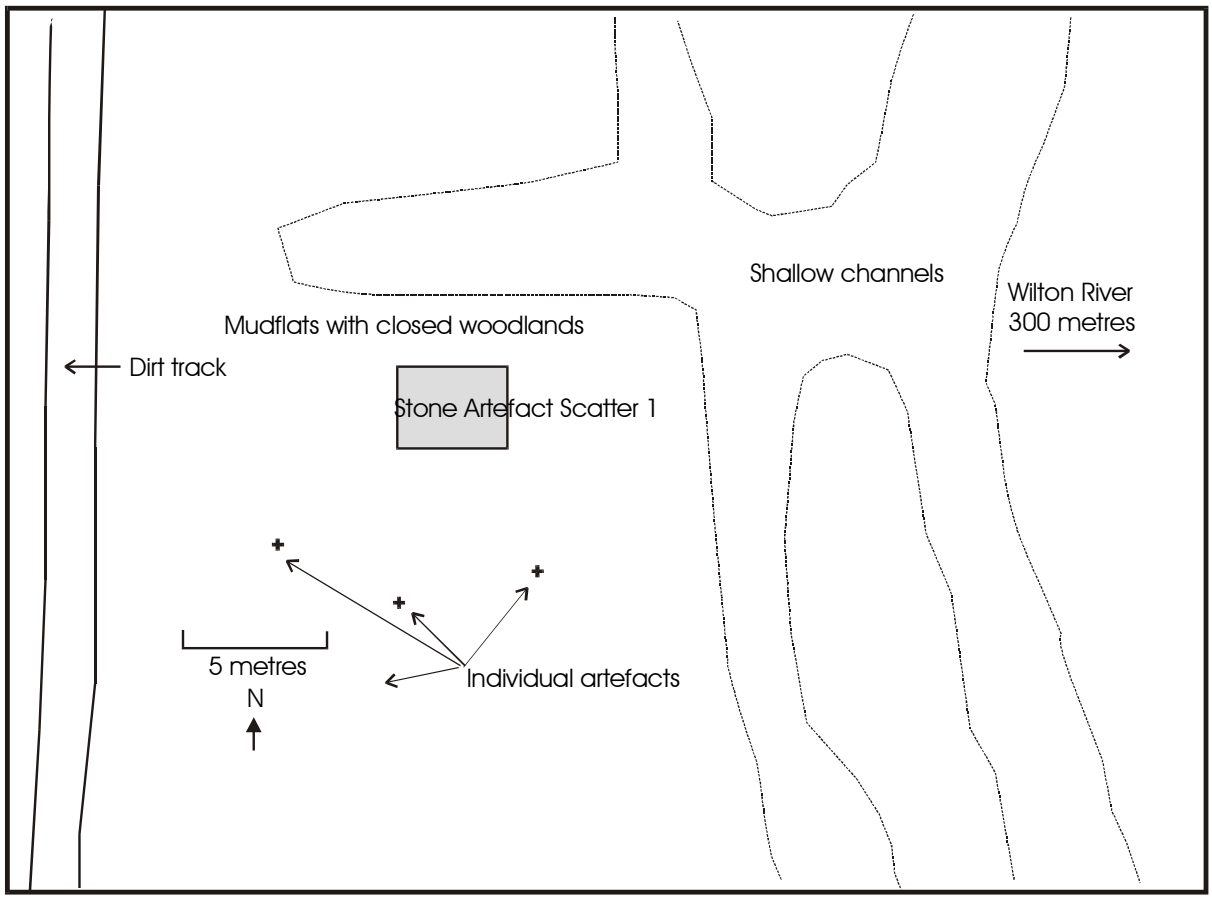
Site integrity: Unstable floodplain area with several shallow channels in the area.

Site dimensions: 4 x 2 metres

Artefact densities: Maximum: 6/m^2, Average:0.8/m^2

Relationship to proposed pipeline: Located along the Mainoru by-pass and approximately 22km south of proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: The site is in a location where the shallow water channels appear to be unstable and the area is regularly disturbed by cattle. The small size of the site and the low number of artefacts in the area result in this site having little potential for further research. The only research potential would be to generate information regarding stone tool technologies of the area. Therefore the site is deemed to have low to moderate archaeological significance.



Site 3
Stone Artefact Scatter 2

Location: 53 444203E 8463504N Marumba 5770 1.100,00 map sheet
-13.78979°S 134.4836°E

Land System: McArthur

Geomorphic Context: Stony hill

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-60%, Minimum-5%. Average-50%

Site location: The site is located on a high steep hill overlooking the Wilton River that is located approximately 3 kilometres to the west and Mt Catt can be seen to the north. The area consists of open woodlands with a low sandstone outcrop near the edge of the hill top and skeletal soils covered in long grass and heavy leaf litter.

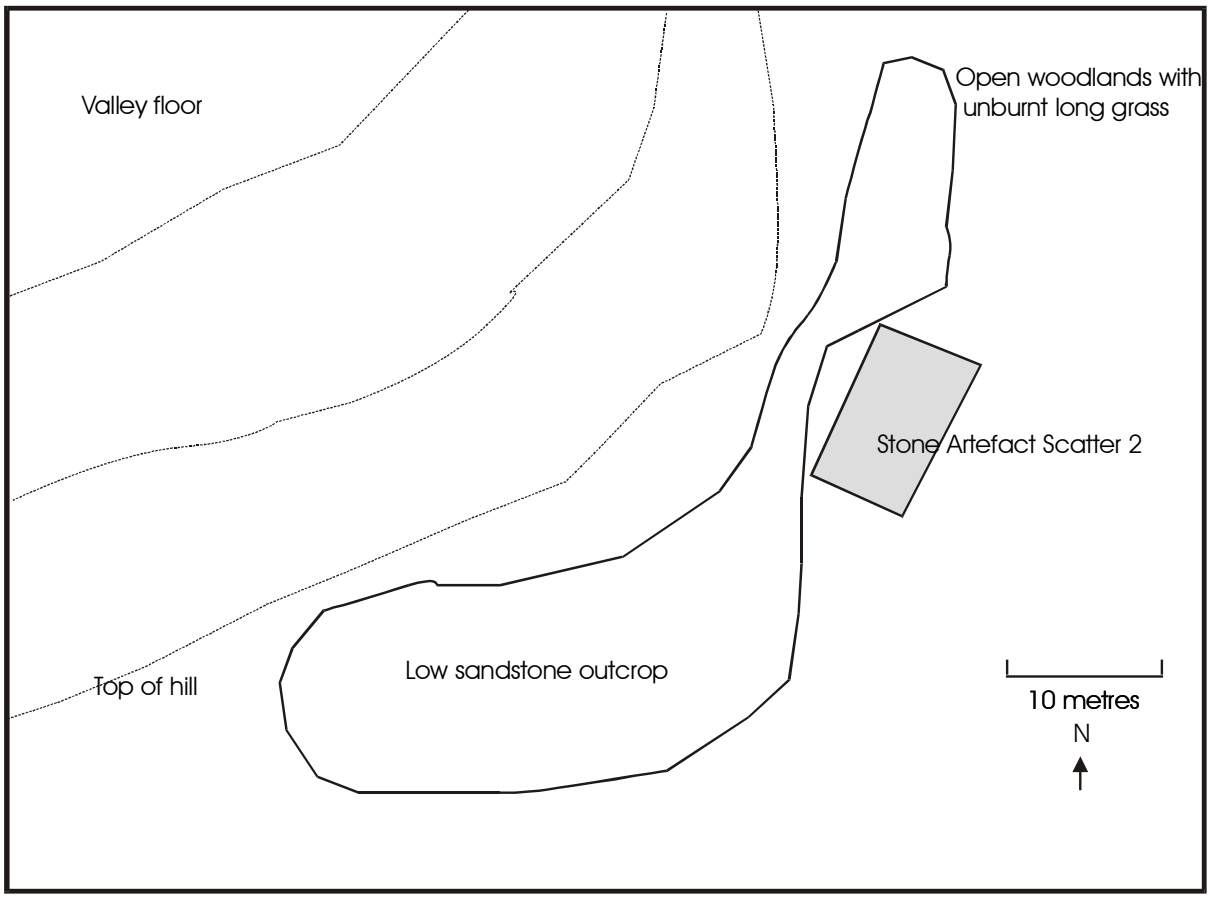
Site description: The artefact scatter is located 5 metres from the edge of the level hill. Artefacts include three bifacial and one unifacial chert points, two cores and the remainder are unretouched flakes. The unifacial point was considerably longer than the two bifacial points, 51 mm and 3.3 and 3.5mm respectively. All artefacts are highly weathered. The raw material is spotted tuff 10%, chert 80% and 10% grey siltstone. The average length of the stone artefacts was 40 mm. There was no area of the site where there was a greater concentration of artefacts than elsewhere. The site has not been disturbed.

Site dimensions: 11 x 8metres

Artefact densities: Maximum: 3/m^2, Average: 0.2/m^2

Relationship to proposed pipeline: Located along the Mainoru by-pass and south of proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: Although the site does not have a dense scatter of artefacts there is a relatively wide range of raw material and artefact types. Consequently as the site has the potential to generate information regarding stone tool technologies the site has been assessed as having medium archaeological significance.



Site 4.
Stone Artefact Scatter 3

Location: 53 455853E 8479412N Nymbilli 5870 1:100,000 map sheet
-13.7543°S 134.5916°E

Land System: Emmerugga

Geomorphic Context: Creek.

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum- 100%, Minimum-95%. Average-98%

Site location: The site is located approximately half way between Jasper Creek and Showell Creek and is approximately 8 kilometres northeast of Black Mountain in an area of alluvial plains and open woodlands. It is next to an unnamed creek which has a string of billabongs some of which still contained water. There is a steep stony hill approximately 50 metres to the northeast.

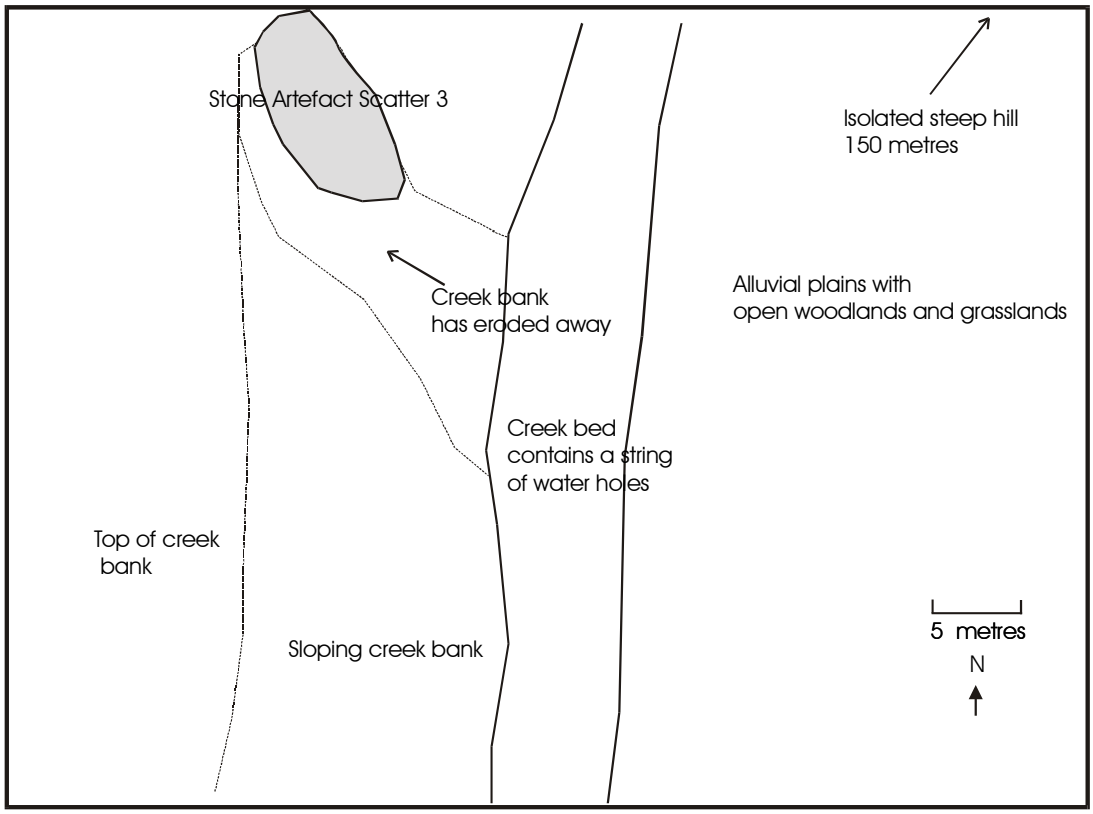
Site description: The stone artefacts are eroding from the top of the western banks of the creek bed and the majority of flakes have fallen down the side of the slope. The area would be flooded during the wet season and disturbed by water gullying. There are approximately 15 unretouched flakes manufactured from a fine grey siltstone, one of silcrete and a unifacial chert point. One large siltstone core had been prepared to remove a series of large flakes. The average length of the flakes was 60mm

Site dimensions: 6 x 15 metres

Artefact densities: Maximum: 3/m^2, Average: 0.06 /m^2

Relationship to proposed pipeline: Located along the Mainoru by-pass and south of proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: The area around the creek appears to undergo sedimentation process during the wet season and the only artefacts identified along the creek were situated in an area where the bank was being eroded. As the identified artefacts were being displaced down the bank, the site has little stratigraphic integrity in this location. However there is a high potential for the presence of more artefacts under the surface in adjacent areas along the creek banks. Therefore the site has been assessed has having a moderate archaeological significance as there is the potential to contribute to archaeological research for the region.



Site 4, facing southeast

Site 5, facing west

Site 5.
Stone Artefact Scatter 4.

Location: 52 478926E 8525861N Annie Creek 5871 1:100,000 map sheet
-13.3345°S 134.8054°E

Land System: Klatt

Geomorphic Context: Stony rise on lower edges of high ground.

Method of Discovery: Pedestrian transect

Ground surface visibility: 50%

Site location: The site is located on the lower slopes between a lateritic, stony plain and a steep stony hill. The area is covered in open woodland was recently burnt.

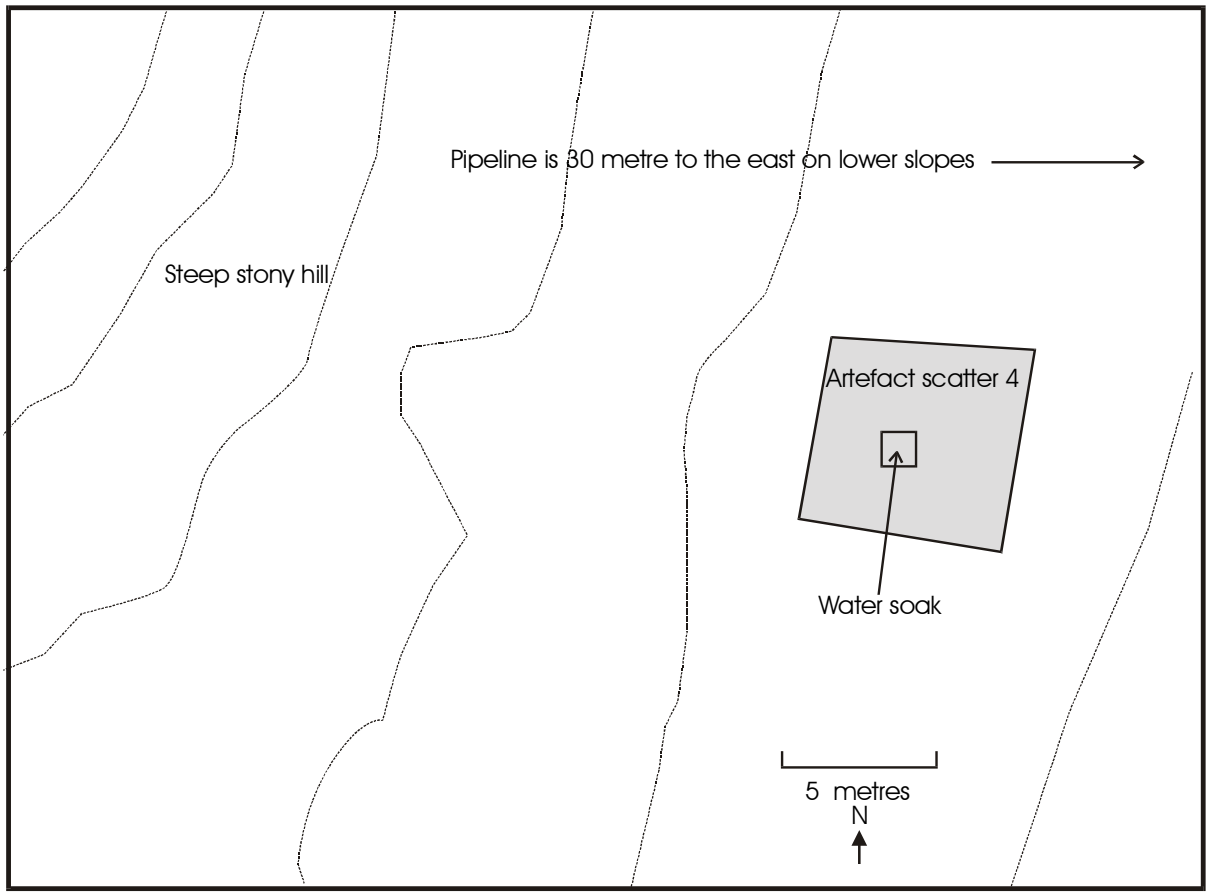
Site description: The site consists of a small water soak one metre square located on the side of the rocky slope and is surrounded by a low density of ochre pieces and one fine grained quartzite axe, ground along one side only. One chert unretouched flake was located 50 metres from the soak at the bottom of the hill. The ochre pieces did not appear to be a local stone and none had signs of being altered by flaking or rubbing.

Site dimensions: 5 x 5m

Artefact densities: Average: 2/m^2

Relationship to proposed pipeline: Site 5 is 60 metres from the proposed pipeline route revision 7 and may be disturbed by the development.

Archaeological significance: While this site has a low potential for further archaeological research, the site has moderate to high archaeological significance because of the uniqueness of the combination of features present; the ground stone axe, ochre and water soak.



Site 6
Burial 1

Location: 53 394450E 8445100N Marumba 5770 1:100,000 map sheet
-14.0629^{o}S 134.0210^{o}E

Land System: Cliffdale

Geomorphic Context: Hilltop

Method of Discovery: Verbal information from Traditional Owners

Site location: The site is located on the top of the southern side of the more easterly hill of "The Twins" on Mainoru Station. The location details above are only an approximation, as the site was not visited

Site description: The skeletal remains are those of an Aboriginal Rumbarumpa, speared by another Aboriginal working at Mainoru Station. The owners of the station at the time asked that Rumbarumpa be punished as he was thought to be killing cattle

Relationship to proposed pipeline: Site 5 is approximately 350 metres north of the pipeline and will not be disturbed by the development.

Significance: As Site 4 contains skeletal remains it is deemed to have both high archaeological and historic significance.

Site 7.
Policeman's Yard

Location: 53 372033E 8432870N Flying Fox 1:100,00 map sheet
-14.17308°S 133.8142°E

Land System: McArthur

Geomorphic Context: Black soil plains

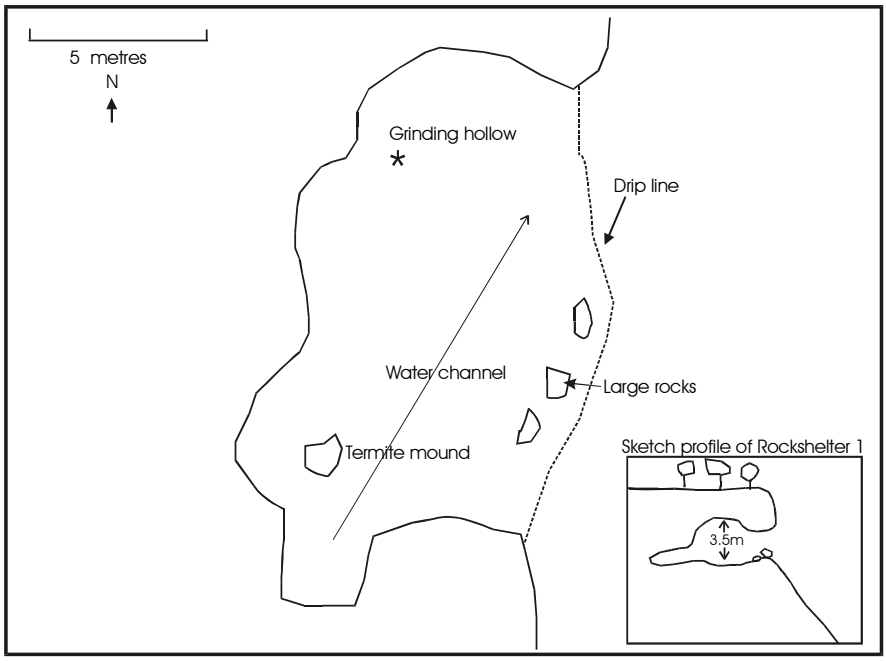
Method of Discovery: Verbal information from Traditional Owners

Site location: The site is located on alluvial plains and consists of a cattle yard on Mountain Valley Station that appears to still be in use. The yard was not visited as the information was not given until the survey team had passed the area.

Site description: The traditional owners said that a policeman was speared at this location during the 1950s and the cattle yard is named after the event.

Archaeological significance: After researching the possibility of the spearing event and communications with Dr. Bill Wilson from CDU, no evidence was found for a spearing of a policeman at the site. Therefore this site is assessed at this time as having no historic significance.

Site 9.
Rock shelter 1.
Location: 52 739062E 8397167N Jinduckin 5169 1:100,00 map sheet
-14.4878°S 131.2180°E
Land System: Mullaman
Geomorphic Context: Edge of escarpment.
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum-100%, Minimum-100 %. Average-100 %
Site location: The site is located in the Upper Daly Aboriginal Land Trust and approximately 12 kilometres west of Bradshaw Creek on the edge of the escarpment overlooking a steep sided valley at the bottom of which is a creek that contained small pools of water at the end of the dry season. The escarpment is covered in open forest and long grass and some areas had been recently burnt.
Site description: The rock shelter is located in ferruginous sandstone at the top of the escarpment and requires a short small climb down from the edge over large boulders. The shelter was inhabited by small bats and contained the remains of at least dead two wallabies. Water appears to flow through the shelter resulting in the surface of the shelter sloping gently down from the south west to the north and there are two low stony cavities in the southern back section of the shelter. The majority of the surface consists of bedrock at the back of the shelter and small rocks from roof fall in the southwest section that is much lower than the other areas of the shelter. There is a small area in the front, between boulders that may have a sediment depth of 0.5metre. Most of the stone artefacts were located in the back of the shelter and the remainder are eroding out from the water channel. The majority of stone artefacts are manufactured from silcrete and smaller proportions of siltstone, white chert, red chert flakes and cores. Five cores and five retouched flakes were located on the surface. The average length of the flakes was estimated to be 45mm, with a maximum of 70mm and a minimum of 11mm. A grinding hollow is located on the bedrock floor near the back of the northern section of the shelter and measures 85cm in diameter and 20cm in depth.
As requested by the Traditional Owners there are no photographs of this site.
Site dimensions: 12 x 6 x 2.2 metres
Artefact densities: Maximum: 8/m^2, Average: 0.5 /m^2
Relationship to proposed pipeline: Site 9 is 250 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.
Archaeological significance: As this site may have a deposit of up to 50cm and has a moderate density and diversity of stone artefacts Site 9 possesses potential for gaining reliable chronological information from an excavation of the site. Therefore the site has high archaeological significance.



Site 10.
Rock shelter 2

Location: 52 739082E 8397095N Jinduckin 5169 1:100,000 map sheet
-14.4884°S 131.2182°E

Land System Mullaman

Geomorphic Context: Edge of escarpment

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-100%. Average-100%

Site location: This site is next to Rock Shelter 1 and access is by a 20 metres clamber south from Rock shelter 1 over boulders and along the steep slope.

Site description: This shelter is smaller and darker than Rock Shelter 1.The surface is covered by roof fall and has been disturbed by shallow hollows made by macropods. There does not appear to be much soil depth above the rock floor. The artefacts consists one core, one retouched flake and the remainder are unretouched flakes. The raw material used is either silcrete or siltstone and two artefacts were made from a red chert. The average length of the flakes was 30mm, the maximum 42mm and the minimum 25mm.

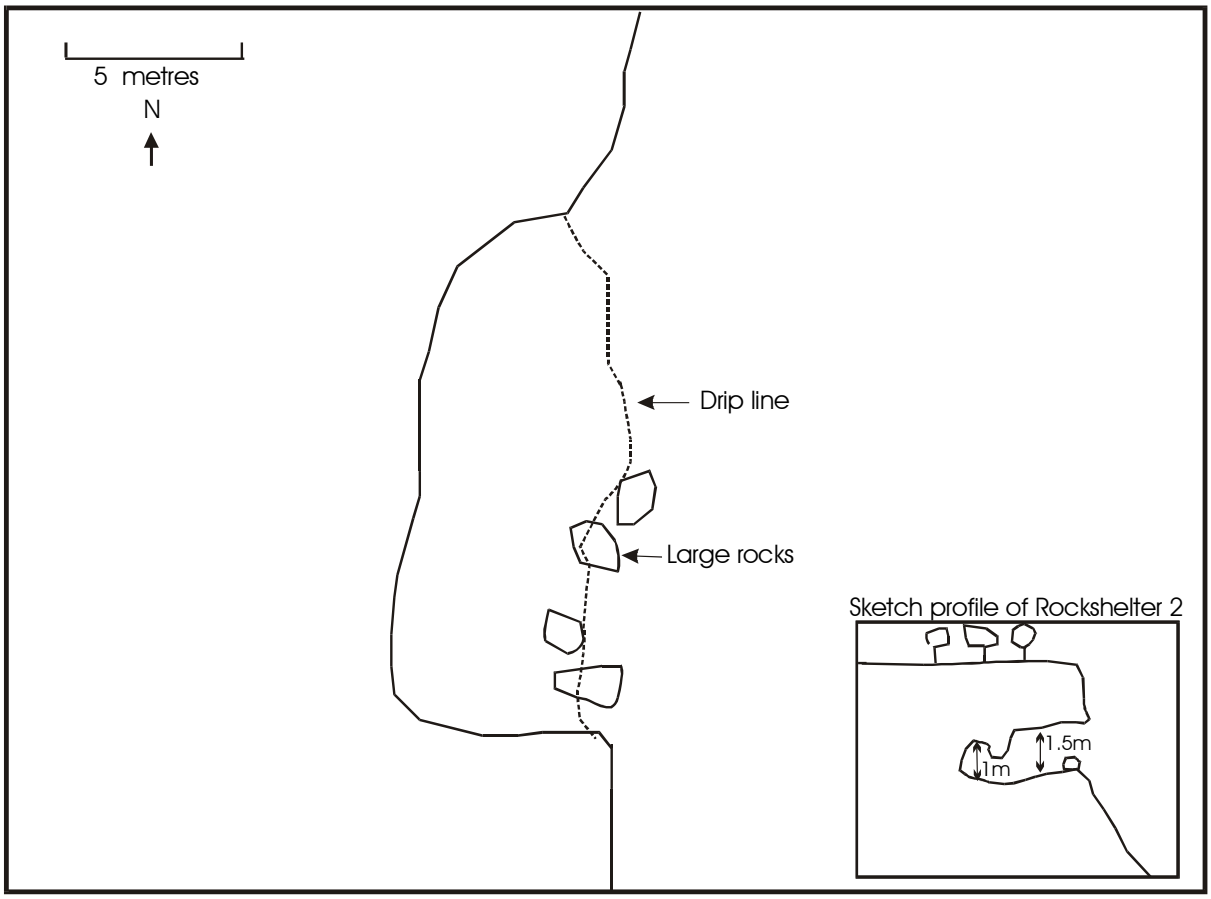
As requested by the Traditional Owners there are no photographs of this site

Site dimensions: 10 x 5 x 3m

Artefact densities: Maximum: 1/m^2, Average: 0.1 /m^2.

Relationship to pipeline: Site 10 is 190 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: As there does not appear to be any depth to the deposit in the rock shelter there is a low potential for a productive excavation. However as it is part of a group of sites located in a small area, there is a high potential for research questions related to site function and settlement patterns. Consequently the site has moderate archaeological significance.



Site 11.
Stone Artefact Scatter 5

Location: 52 739138E 8397064N Jinduckin 5169 1:100,000 map sheet
-14.4887°S 131.2187°E

Land System Mullaman

Geomorphic Context: Edge of escarpment.

Method of Discovery: Pedestrian transect.

Ground surface visibility %: Maximum-100%, Minimum-95%. Average-95%

Site location: The site is located approximately 15 metres south of Rockshelter 2 on top of the escarpment. The grass covered open woodland in the area had been recently burnt and the surface consisted of skeletal soils and occasional low outcrops of sandstone.

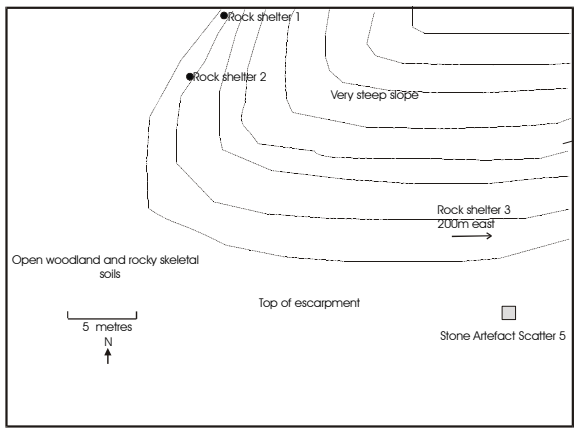
Site description: The small stone artefact scatter is on the edge of the escarpment overlooking the valley below and on a stable surface. As the artefacts were concentrated in one area the site probably represents a knapping site of twenty one artefacts consisting of unretouched flakes, flaked pieces and two cores all made from a fine grained sedimentary rock that the Traditional Owners stated was brought in from the west. The average length of the flakes was 58mm.

Site dimensions: 2 x 1metre

Artefact densities: Maximum: 12/m^2, Average: 10/m^2

Relationship to proposed pipeline: Site 11 is 190 north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: The site probably represents a single knapping event and as such it has the potential to contribute to research questions relating to stone reduction sequences. This site is also part of a cluster of sites that possess a high potential answering research questions related to site function and settlement patterns. Consequently the site has moderate to high archaeological significance.



Site 11.

Site 12.
Rock Shelter 3

Location: 52 739358E 8397166N Jinduckin 5169 1:100,000 map sheet
-14.4878°S 131.2207°E

Land System: Mullaman

Geomorphic Context: Edge of escarpment

Method of Discovery: Pedestrian transect.

Ground surface visibility %: Maximum-100%, Minimum-100%. Average-100%

Site location: The site is situated across the small valley east of Rock shelter 1 and is located on the top of a very steep rocky slope. Access is by walking under and along a rock outcrop at the top of the slope.

Site description: The small rock shelter has a rubbleand stony surface with patches of sandy soils between the bedrock boulders. These areas have been disturbed by macropods. Water flows from the back through the site in the wet season. The estimated depth of the sandy deposit is less than 40cm. The silcrete and siltstone artefacts consisting of one core and unretouched flakes, are mostly located near the back of the shelter where they are eroding out of the sandy soil. The artefact dimensions range from 12mm to 80mm and the average is estimated to be 35mm.

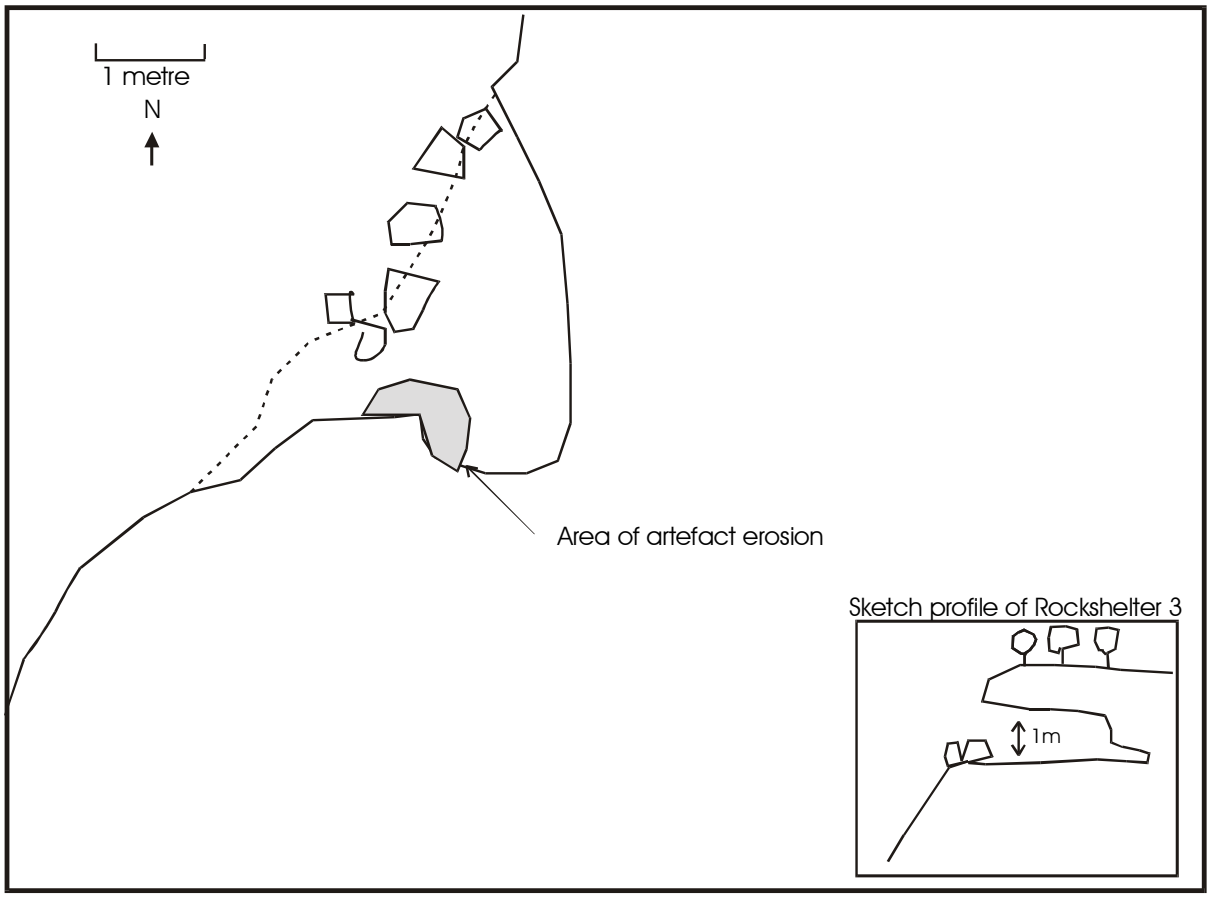
As requested by the Traditional Owners there are no photographs of this site

Site dimensions: 9 x 3 x 1m

Artefact densities: Maximum: 4/m^2, Average: 0.4/m^2

Relationship to proposed pipeline: Site 12 is metres 360m north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: This site may have the potential for an excavation even though there are only small undisturbed areas on the shelter floor. This site is also part of a cluster of sites that possess a high potential for answering research questions related to site function and settlement patterns Therefore the site has moderate archaeological significance.



Site 13.
Stone Artefact Scatter 6

Location: 52782163E 8394802N Bowman 5268 1:100,000 map sheet
-14.5050°S 131.6179°E

Land System: Jindara

Geomorphic Context Hilltop

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-75%. Average-85%

Site location: The site is located approximately 6 kilometres west of the Daly River on the top of a rocky limestone hill overlooking a broad valley and a high mesa to the northwest. There is a steep slope to the north and west of the site and a more gentle slope to the east. The area is covered in low open woodland that had been recently burnt

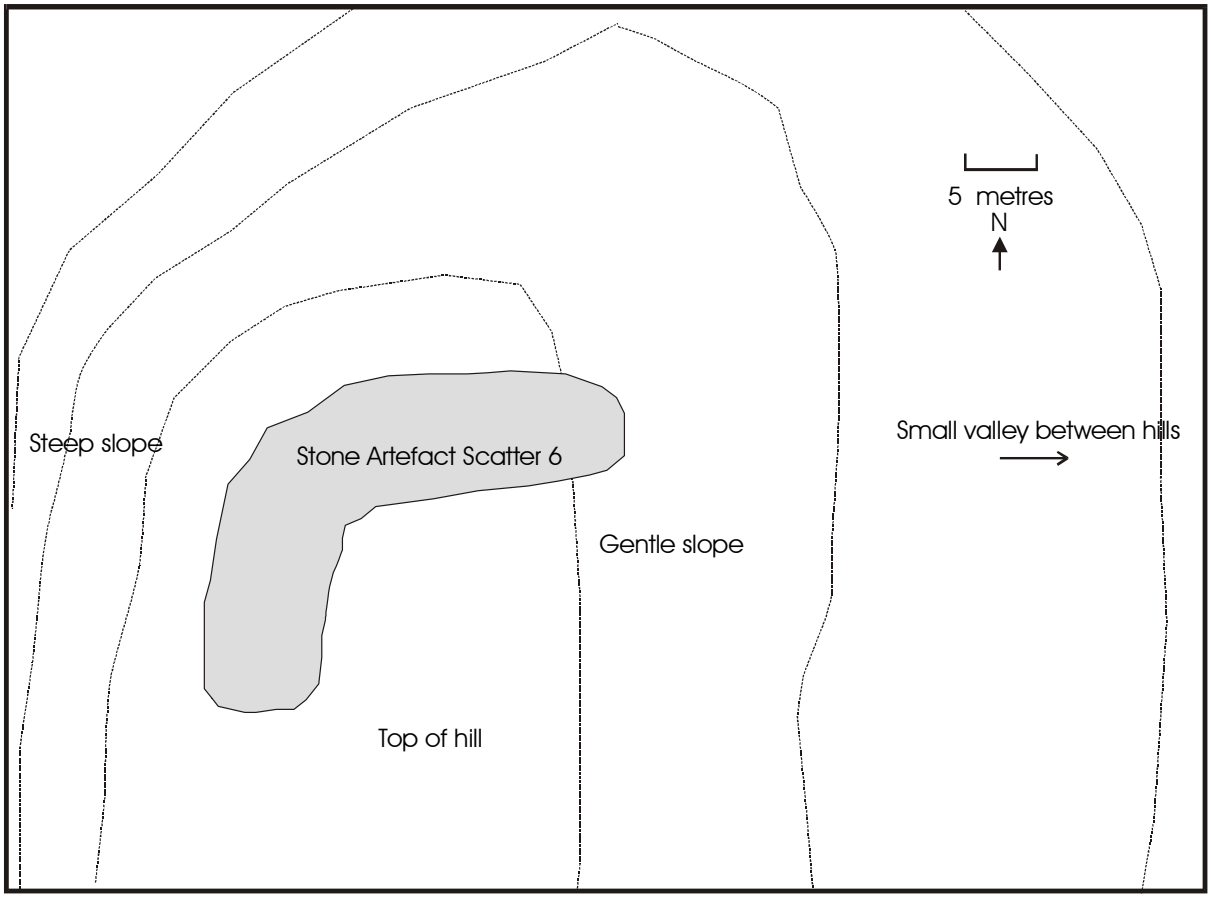
Site description: The artefacts are scattered over an L-shaped area that is mostly undisturbed except for the area on the eastern slope where erosion has occurred. There are several areas on the higher ground where the artefacts are more dense (an average of $3/m^2$). Between these concentrations the density is approximately $0.1/m^2$. The unretouched flakes were manufactured mainly from a pink/red chert and the remainder from siltstone and silcrete. The lengths of the flakes ranged from 32mm to 15mm and the average length of the flakes was estimated to be 28mm.

Site dimensions: 20 x 25metres and 6 metres wide.

Artefact densities: Maximum: $6/m^2$, Average: $0.25/m^2$

Relationship to proposed pipeline: Site 13 is 105 metres from the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: This stone artefact scatter contains variety of raw material and artefact types and has the potential for further research related to stone tool manufacture and procurement and consequently is assess as having a moderate archaeological significance.



13. Site 14.
Quarry 1.

Location: 52 787734E 8394746N Bowman 5268 1:100,000 map sheet
-14.5050°S 131.6695°E

Land System: Banyan

Geomorphic Context Stony hills

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-99%, Minimum-90%. Average-95%

Site location: The site is approximately 300 metres west of the Daly River in an area of low, small but steep rocky rises that had been recently burnt and covered in open woodlands and skeletal soils. The gullies between the rises are run off areas during the wet season.

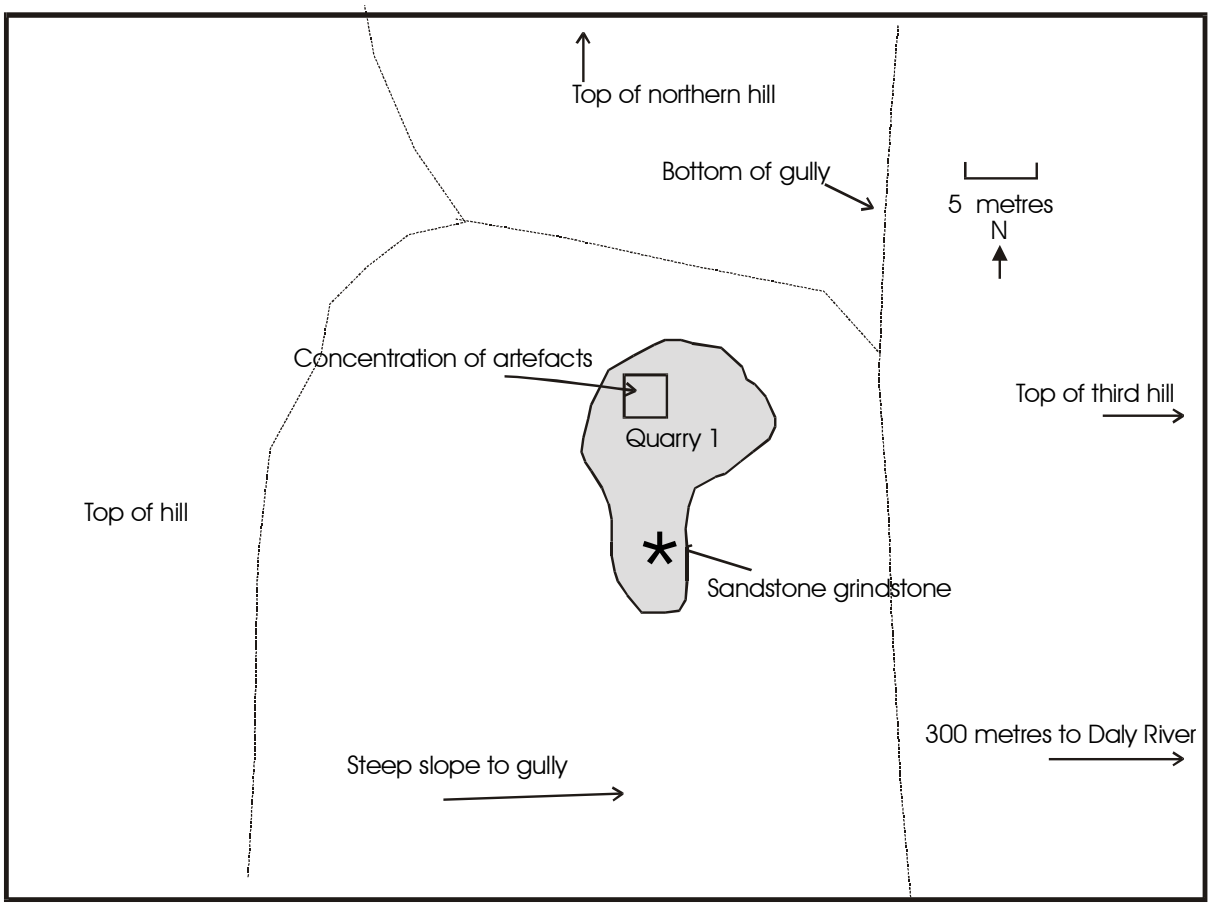
Site description: The stone artefacts are located on the lowest of three small rises in the area that are separated by a rocky gully. The area has not been disturbed. The artefacts are mostly located on a level area 3 x 3 metres on the lower section of the slope with other flakes located down slope. Examination of the other rises failed to identify any stone artefacts however there were small nodules of chert lying in the area. Four chert cores, fourteen chert unretouched flakes and one sandstone grindstone measuring 56 x 45 x 26cm were located in the site area. The average length of the chert flakes and cores was 35mm and 50mm respectively.

Site dimensions: 10 x 5 metres

Artefact densities: Maximum: 4/m^2, Average: 4/m^2

Relationship to proposed pipeline: Site 14 is located 145 metres north of the proposed pipeline route revision 7 and will not be disturbed by the devlopment.

Archaeological significance: As chert quarries are relatively common in the Daly River area and Site 15 has a low density of artefacts, the site is considered to have low to moderate archaeological significance.



Site 14, facing south

Site 15.
Manbulloo Airstrip

Location: 53 196719E 8385427N Manbullo 5368 1:100,00 map sheet
-14.5874°S 132.1852°E

Land System: Tagoman

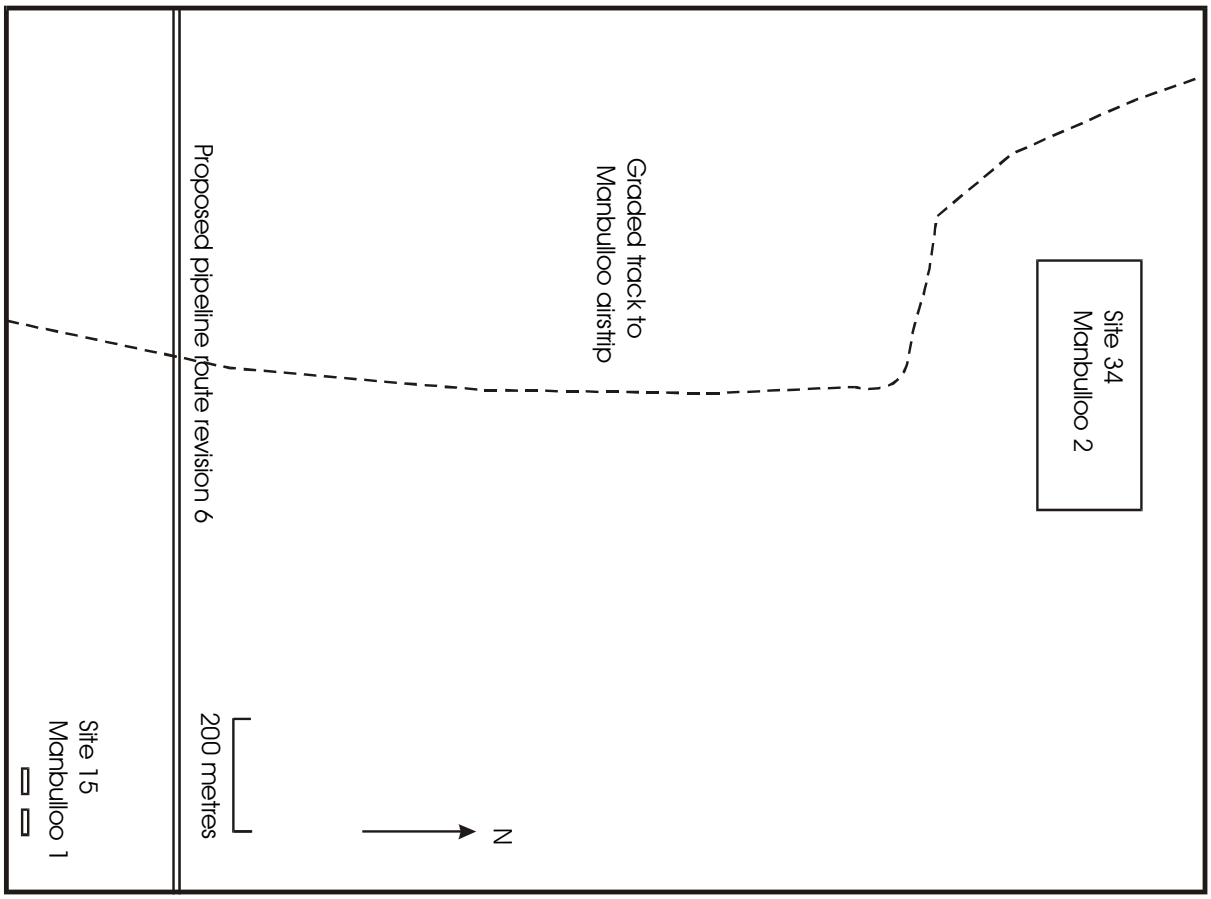
Method of Discovery: Vehicle transect.

The remains of two structures made from 44-gallon drums were observed south of the pipeline route in an area of open woodlands. Both structures appeared the same and consisted of two rows of 44 gallon drums placed on top of each other and arranged in a rectangular shape.

These structures are the most northern section of the remains of the infrastructure built to the north of the runway during World War II and have been previously recorded in detail by Alford in

Relationship to proposed pipeline: Site 15 is approximately130 metres south of the proposed pipeline route revision 7.

Archaeological and historic significance: This site provides information contributing to a broader understanding of World War II activities in the region and is assessed as having high historic significance.



Site 16.
Stone Artefact Scatter 7

Location: 52 788431E 8394672N Bowman 5268 1:100,000 map sheet
-14.5056°S 131.6760°E

Land System: Banyan

Geomorphic Context: River bank

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-90%. Average-95%

Site location: The site is located on a rocky bank that runs parallel to the eastern side of the Daly River and has a backwater area on the other side of the rocky outcrop. The banks of the river are steep and sandy. The rocky outcrop is 50 metres north of another rocky outcrop that runs across the river and forms a small waterfall half a metre high at the end of the dry season. The whole area would be submerged during the flood periods of the river.

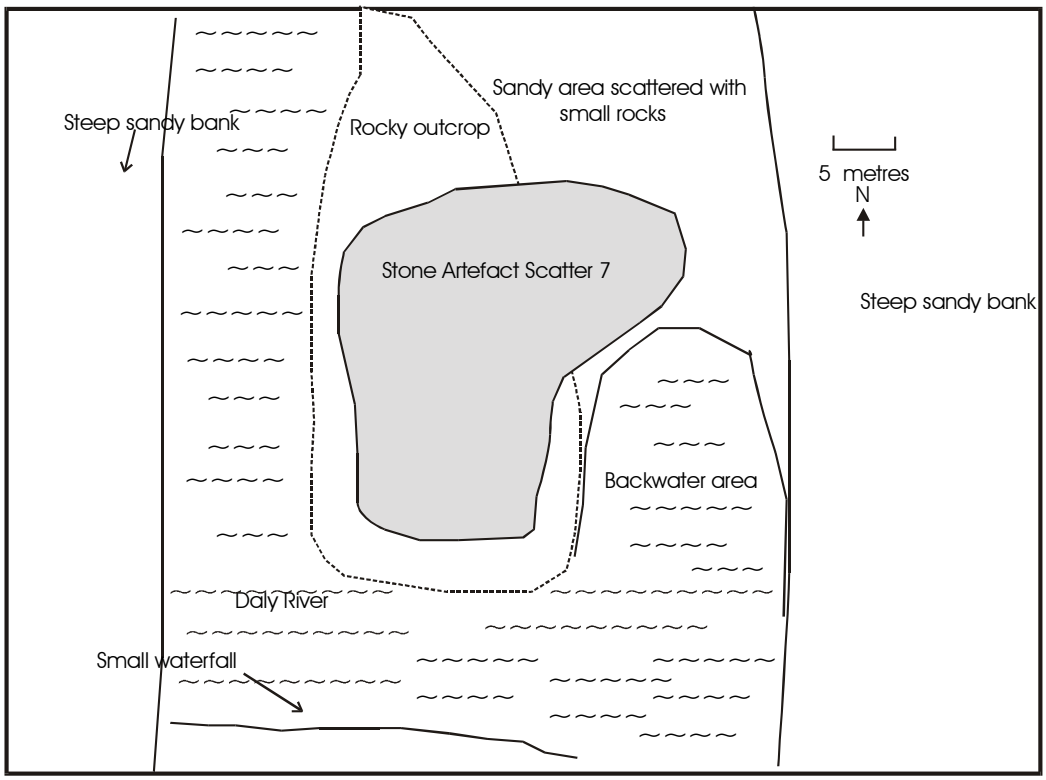
Site description: The stone artefacts are scattered along the rocky outcrop and along the rocky area around the backwater area adjacent to the eastern bank of the river. Most artefacts were embedded in sand that had been deposited between the rocks. The site appears to be scoured out during the flooding of the river each wet season resulting in regular disturbance of the artefacts over the rocks. The artefacts were all manufactured from a bright orange chert of which 90% were unretouched flakes and 5% of both cores and retouched flakes. The largest artefact was a core and measures 101mm in length and the average length of the flakes was 55mm and all appeared water polished.

Site dimensions: 30 metres N-S, 30 metres E-W

Artefact densities: Maximum: 6/m^2, Average: 3 /m^2

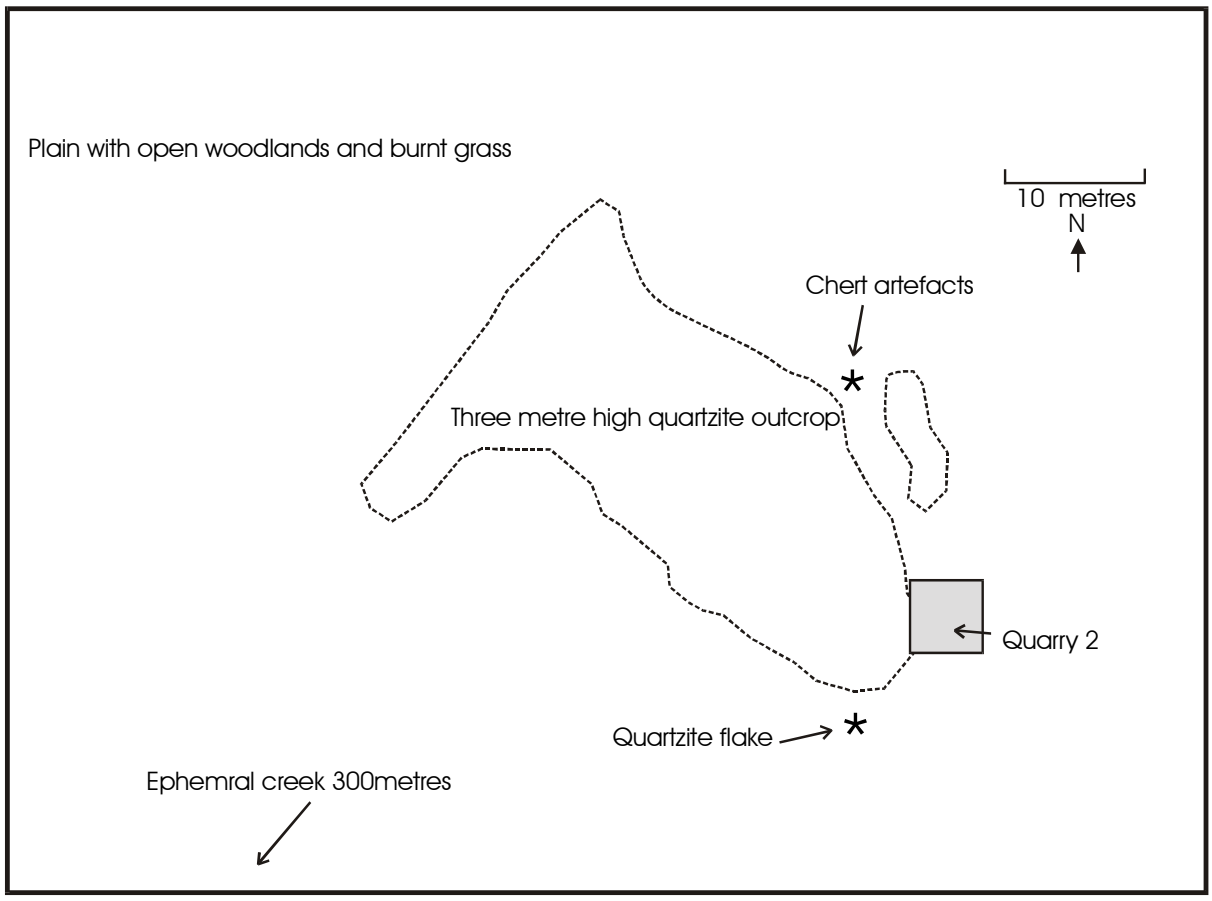
Relationship to proposed pipeline: Site 16 is 85 metres from the proposed pipeline route revision 7. As the pipeline will cross the Daly River underneath the river the site will not be impacted upon at all by the development.

Archaeological significance: The stone artefacts appear to be highly disturbed by flood waters each wet season resulting in a site with low spatial integrity. Consequently the site has little research potential and low archaeological significance.



Site 16, facing south

Site 17.
Quarry 2.
Location: 53 189866E 8386060N Manbulloo 5368 1:100,000 map sheet
-14.5809°S 132.1218°E
Land System: Tagoman
Geomorphic Context Stony outcrop on sandy plain
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum-95%, Minimum-80%. Average-90%
Site location: The site is situated around the perimeter of a low quartzite outcrop, 300 metres east of an ephemeral creek than runs into the Katherine River. The surface surrounding the outcrop consists of sandy clay soils vegetated by open woodlands. The rocky outcrop measures 30 x 15 metres and is approximately 2.5 metres at its highest.
Site description: The quarry consists of a small stone artefact scatter located around the southern and southeastern edges of the outcrop. The southern section has several of areas where the rock has been quarried. Three cores with maximum lengths of 50, 23 and 50mm and approximately 15 unretouched flakes (average length 30mm) were near the quarried rocks. Ten metres to the north east of the site in between smaller outcropping rocks were three small chert flakes. The site does not appear to have been disturbed in the past.
Site dimensions: 5 x 5 metres – area of quarry
Artefact densities: Maximum: 8/m^2, Average:0. 7/m^2
Relationship to proposed pipeline: Site 17 is 110 metres from the proposed pipeline route revision 7 and will not be disturbed by the development.
Archaeological significance: Previous archaeological research has recorded the presence of mainly chert quarries in the area and as the site is intact and located in an area of sedimentation it has the potential for excavation to recover further archaeological data. Therefore the site has a moderate to high archaeological significance.



Site 17 facing west

Site 18 facing northeast

Site 19 facing northeast

Site 20 facing south

Site 18
Stone Artefact Scatter 8

Location: 53 198049E 8385581N Manbulloo 5368 1:100,000 map sheet
-14.5862°S 132.1976°E

Land System: Tagoman

Geomorphic Context: Stony rise next to an ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-90%. Average-95%

Site location: The site is located approximately 2 kilometres north of the Manbulloo airstrip on an eroding rocky slope of recently burnt open woodland 20 metres from an ephemeral creek. There is a low limestone outcrop approximately 10 metres to the south

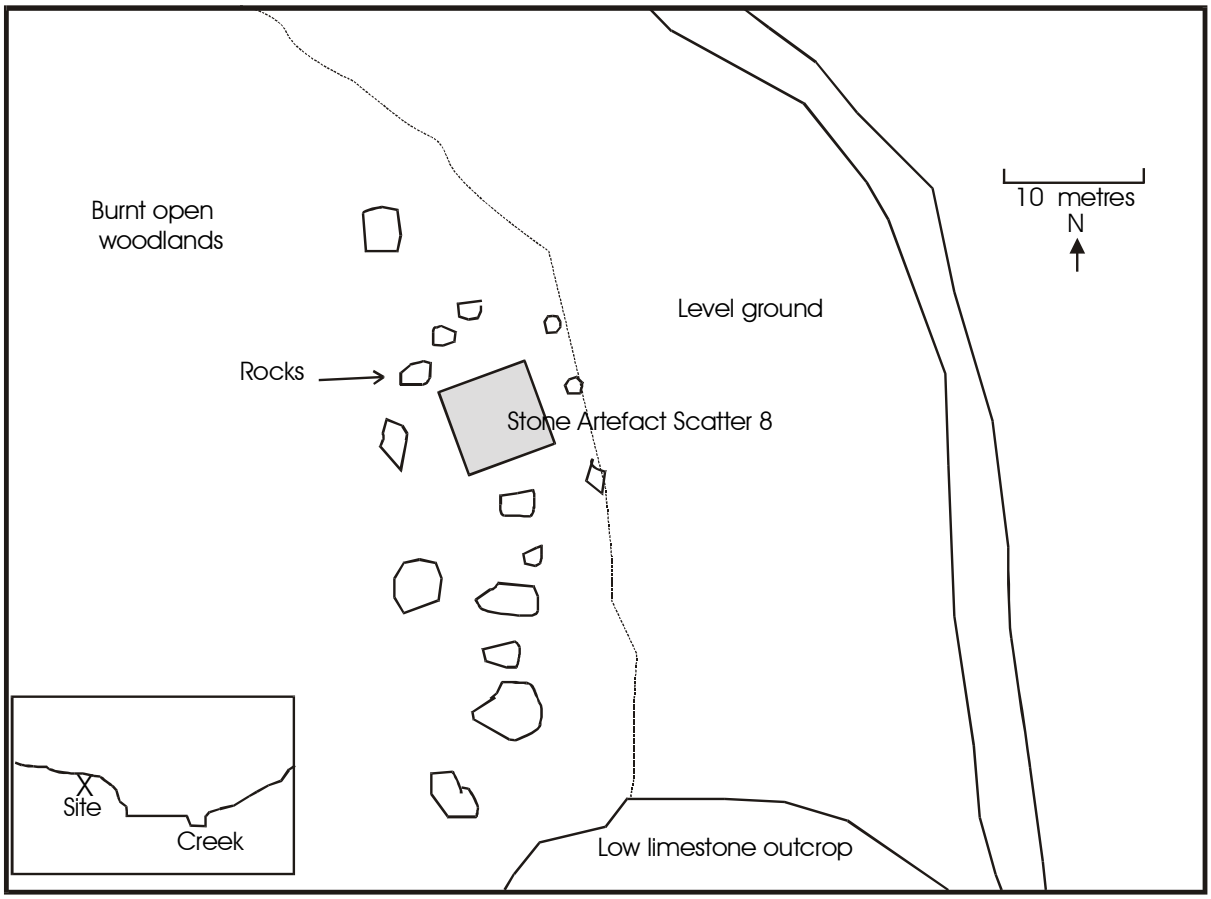
Site description: The site is situated on a small level area on a stony slope that rises from level ground one the western side of the creek. 90% of the artefacts were manufactured from chert and 5% from silcrete and a fine grained sedimentary rock. All artefacts were unretouched flakes except for one chert retouched flake. The maximum length of the flakes was 22 mm and the average was 18 mm

Site dimensions: 5 x 5metres

Artefact densities: Maximum: 4/m^2, Average: 0.1/m^2

Relationship to proposed pipeline: Site 18 is 20 metres north of the pipeline of the proposed pipeline route revision 7 and will be disturbed by the development.

Archaeological significance: The site is small and has a low diversity and density of artefacts and has little potential to contribute further knowledge concerning past settlement patterns or stone tool manufacturing and therefore has low archaeological significance.



Site 19.
Stone Artefact Scatter 9

Location: 53 199939E 8385200N Manbulloo 5368 1:100,000 map sheet
-14.5898°S 132.2151°E

Land System Tagoman

Geomorphic Context: Stony rise.

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-95%, Minimum-80%. Average-85%

Site location: This site is approximately two kilometres east of Site 18. The area around the site consists of stony terraced slopes made from limestone and skeletal soils. The vegetation is open woodlands that have been recently burnt. An ephemeral creek is located less than 100 metres to the north east.

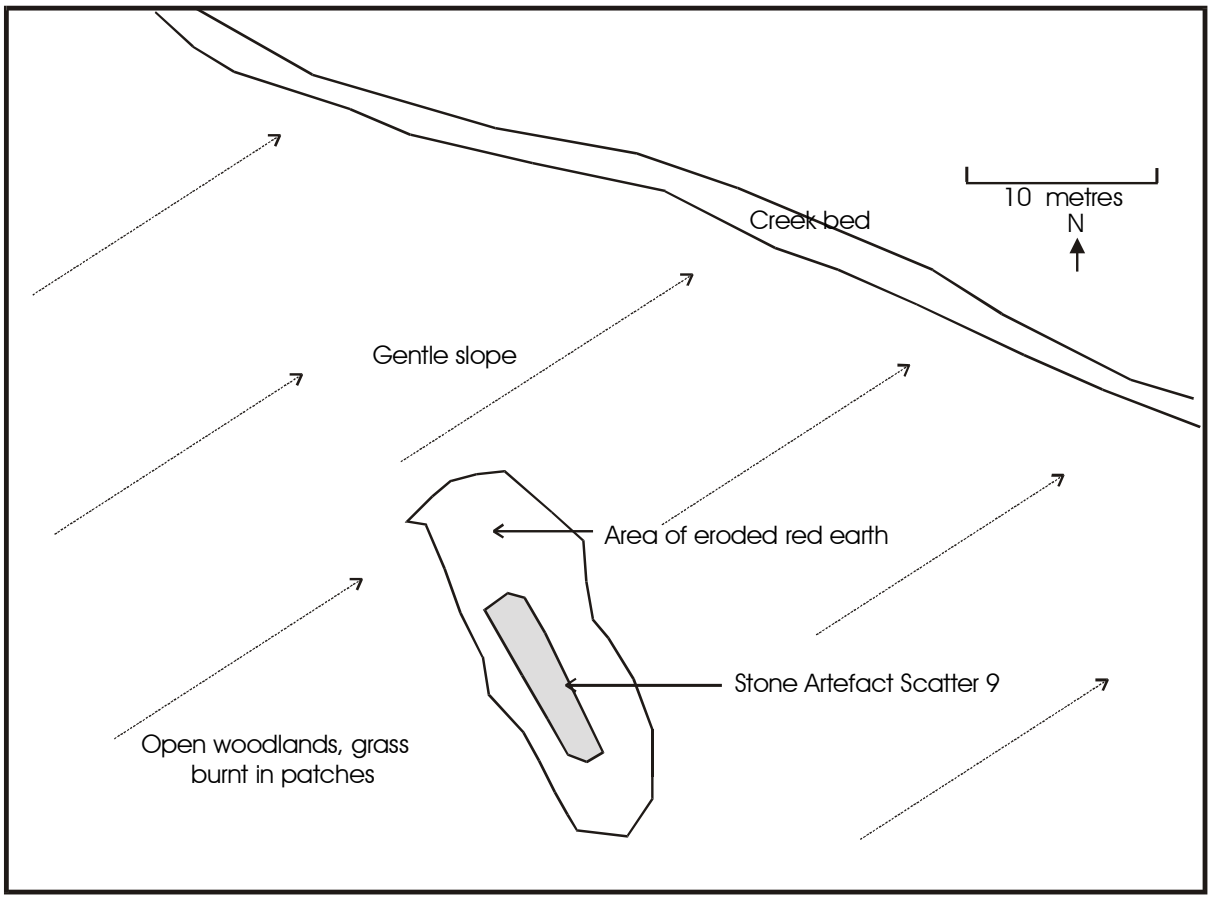
Site description: The stone artefact scatter is situated on a gentle slope and the majority of the artefacts were concentrated in an area of bare red earth, 10 x 2 metres eroded by sheet wash. The majority of artefacts were made from chert and 40% from silcrete. The unretouched flakes were on the small size, average length 12mm. and there was only on retouched flake, the tip of a white chert unifacial point.

Site dimensions: 20 x 4 metres

Artefact densities; Maximum: 5/m^2, Average: 0.25

Relationship to proposed pipeline: Site 19 is 360 metres from the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: As the artefacts are low in density and appear to have been disturbed by the sheet wash the site has little potential for contributing further knowledge and therefore is deemed to have a low archaeological significance.



Site 20.
Stone Artefact Scatter 10

Location: 53 219497E 8382191N Manbullo 5368 1:100,000 map sheet
-14.6191^{o}S 132.3962^{o}E

Land System Kimbya

Geomorphic Context: The banks of an ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-95%, Minimum-10%. Average-80%

Site location: The site is located approximately 10 kilometres south of the Tindal RAAF base on a gentle slope covered by unburnt open woodlands and grass. There is a large area of red soil that has been eroded by sheet wash and gullying up to a metre deep adjacent to an ephemeral creek. In the eroded area there were patches of grass and trees.

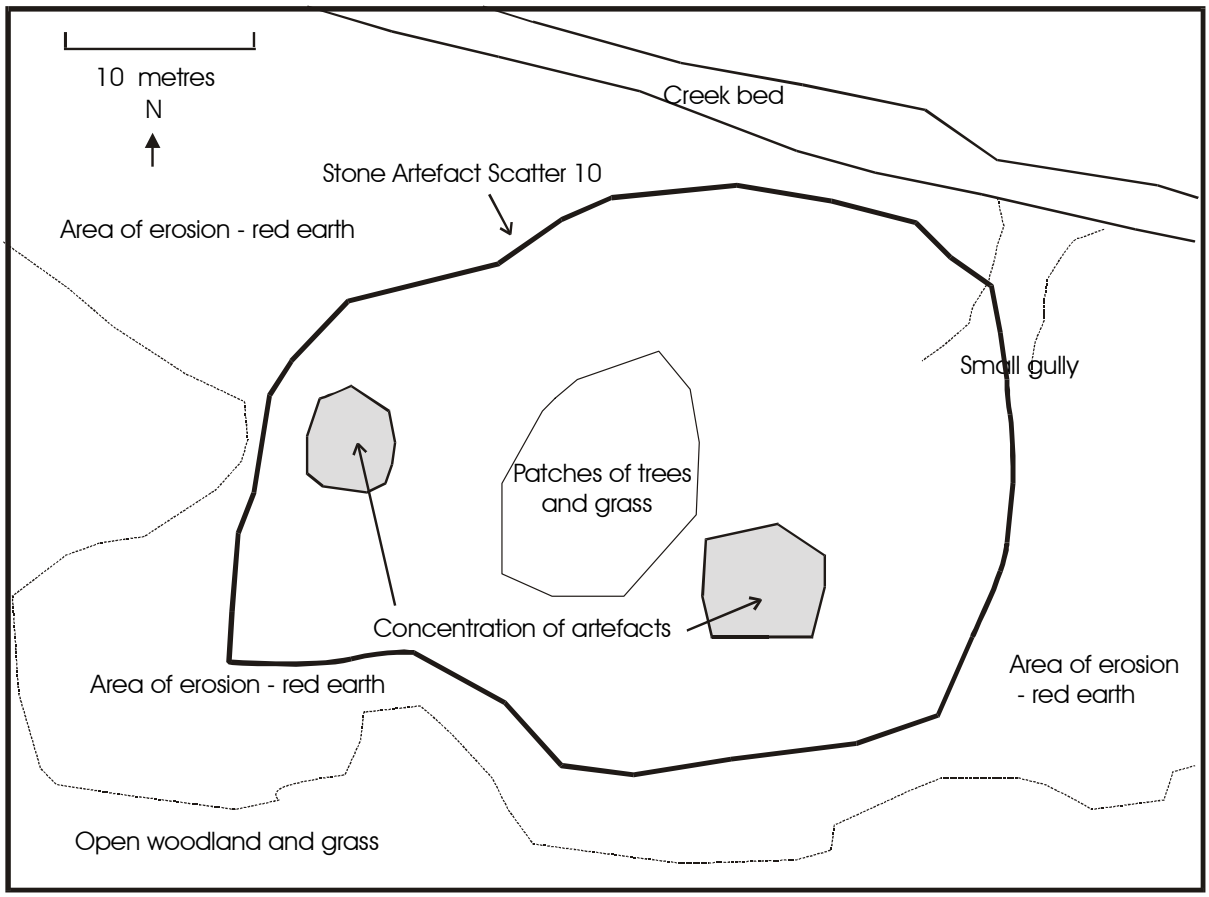
Site description: The artefacts are scattered over most of the large eroded area and there were two smaller areas, 5 x 5 metres, where the concentration of artefacts was much greater. The artefacts were made from chert, silcrete and a fine grained siliceous material. The majority of artefacts were unretouched chert flakes and there were cores of chert and silcrete. There was one edge ground axe of silicified sandstone and an unusual nearly circular retouched (20 x 17 x 4mm) chert flake

Site dimensions: 50 x 50 metres

Artefact densities: Maximum: 6/m^2, Average: 0.1/m^2

Relationship to proposed pipeline: Site 20 is 50 metres from the proposed pipeline route revision 7 and may be disturbed by the development.

Archaeological significance: Although the site has lost some of its spatial integrity because of the erosion in the area, the site has been given moderate archaeological significance because there are several stone artefacts types manufactured from different raw materials, indicating that various activities were carried out in this area.



Site 21
Stone Artefact Scatter 11

Location: 53 226091E 8381820N Manbulloo 5368 1:100,000 map sheet
-14.6231°S 132.4573°E

Land System: Wallingin

Geomorphic Context: Ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-90%. Average-95%

Site location: The surrounding area consisted of unburnt open woodland and grass understorey on gentle slopes leading down to an ephemeral creek. The eastern side of the creek has several large areas that have been eroded by sheet wash.

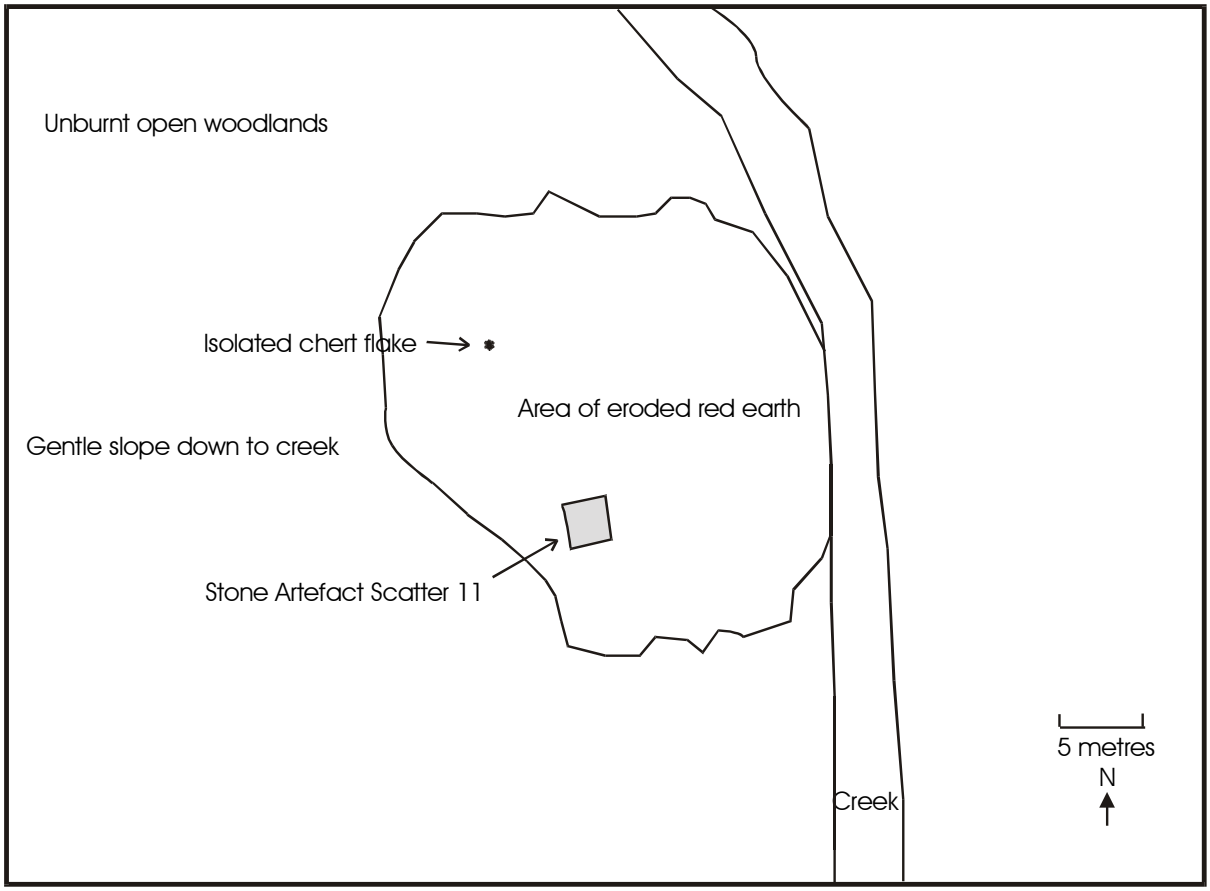
Site description: The stone artefact scatter is located approximately 20 metres from the edge of the dry creek in an eroded area of 25 x 25 metres of red soil. All but one of the artefacts were located in the same small area in south western section of the eroded area. Ninety percent of the artefacts were made from chert and the remainder from silcrete. The average length of the flakes was 30mm. Two chert retouched flakes and one chert core were also identified. One chert flake was located 10 metres from the main concentration of artefacts.

Site dimensions: 3 x 3 metre

Artefact densities: Maximum: 4/m^2, Average: 0.07/m^2

Relationship to proposed pipeline: Site 21 is 60 metres from the proposed pipeline route revision 7 and may be disturbed by the development. As there are other similar eroded slopes along the slope there is a high probability for other sites in the area.

Archaeological significance: As this site is small and has a low density and diversity of artefacts it very little potential to contribute further knowledge regarding past Aboriginal activities in the area and is therefore considered to have low archaeological significance.



Site 21, facing east

Site 22.
Stone Artefact Scatter 12

Location: 53 229852E 8382305N Manbulloo 5368 1:100,000 map sheet
-14.6191°S 132.4923°E

Land System: Wallingin

Geomorphic Context: Ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-95%, Minimum-<5%. Average-40%

Site location: The stone artefacts are situated in an area of open woodland plains / gentle slopes and unburnt grasslands. An ephemeral creek is located 10 metres east of the site and the site is located on a level eroded section of a gentle slope surrounded by thick grass.

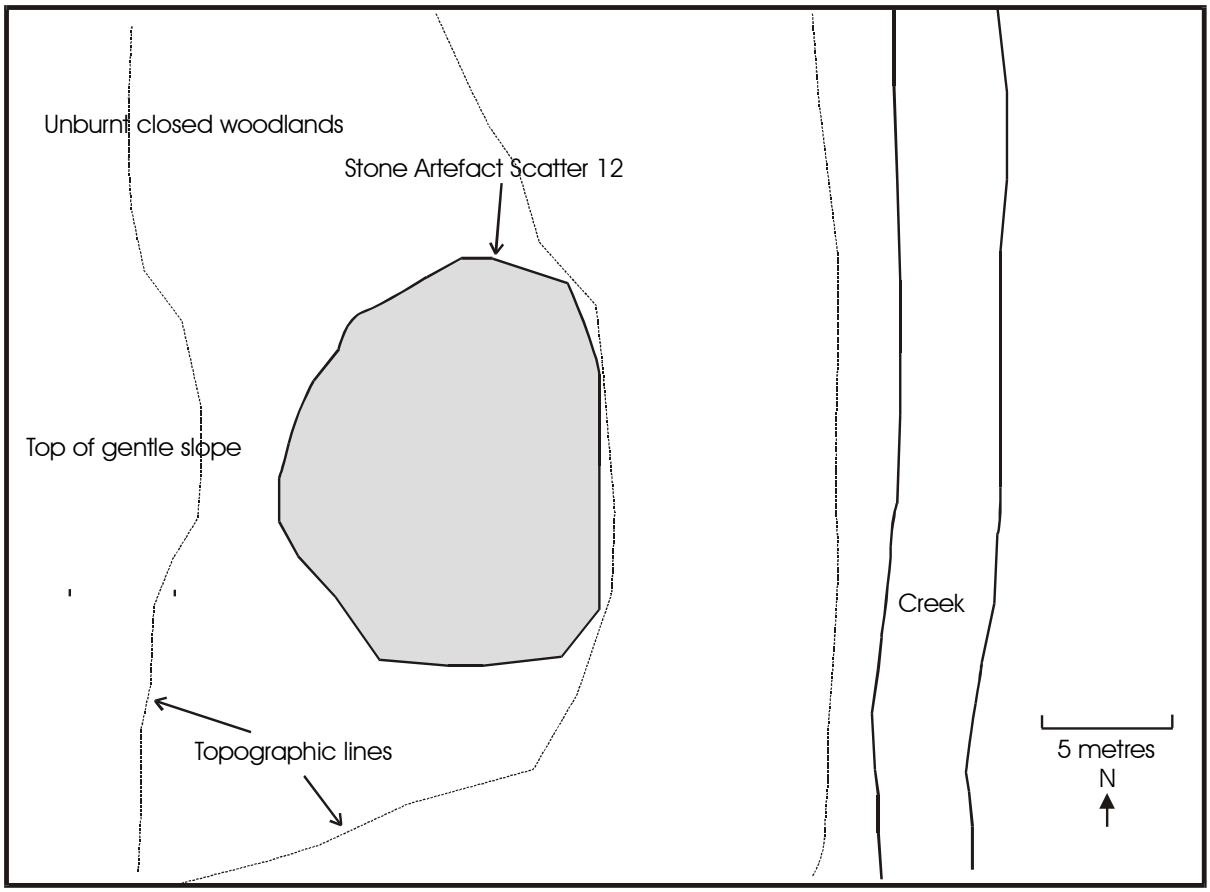
Site description: The boundaries of the site were difficult to determine away from the eroded patches where the stone artefacts were initially located. The eroded surface consisted of gravely sands. Only one unretouched silcrete flake was identified, the remainder were chert unretouched flakes, average length 20mm.

Site dimensions: 10 x 20m

Artefact densities: Maximum: 8/m^2, Average: 0.3/m^2

Relationship to proposed pipeline: Site 22 is 80 metres from the proposed pipeline route revision 7 and may be disturbed by the development.

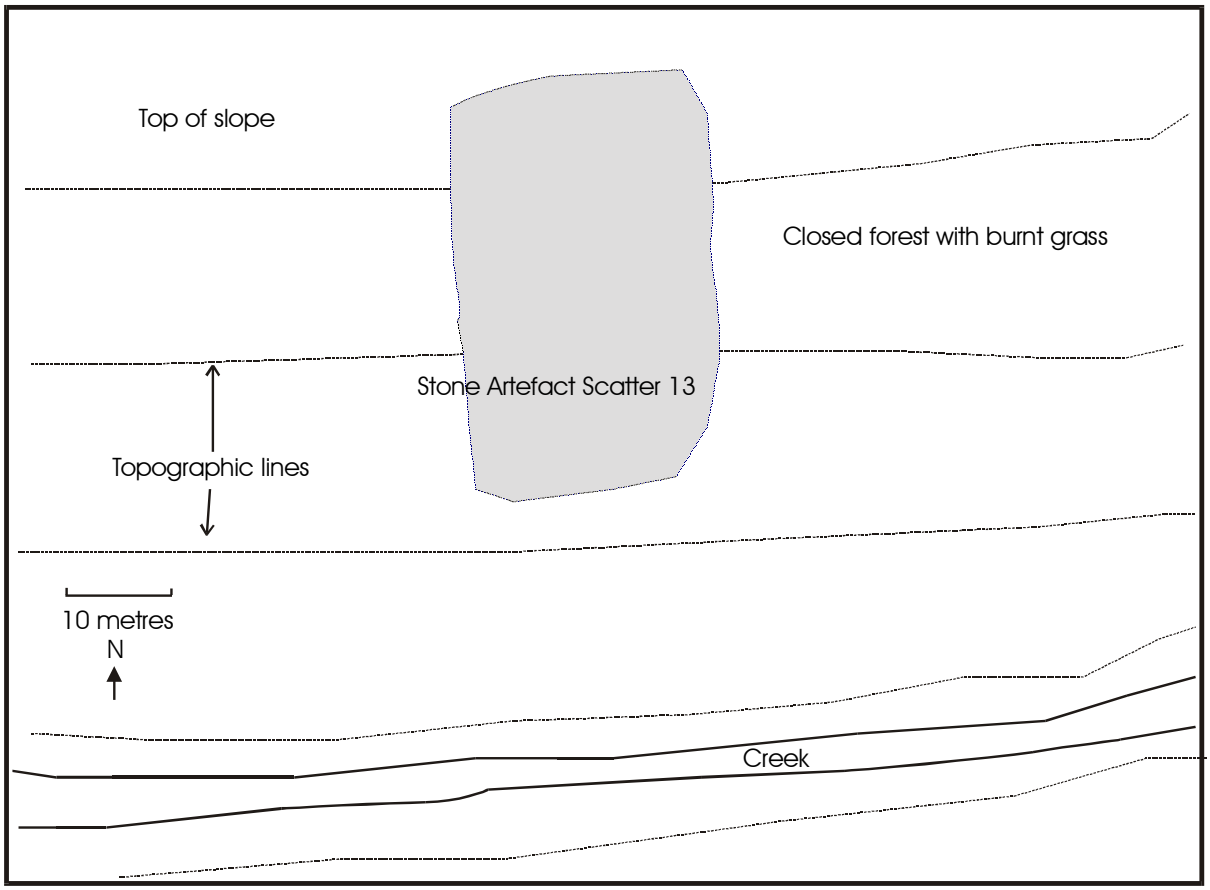
Archaeological significance: As the site is located in an area disturbed by erosion and has a low diversity and density of artefacts it has little potential for further research and consequently has low archaeological significance.



Site 23.
North Australian Railway
Location: 53 238760E 8383285N Maranboy 5468 1:100,000 map sheet
-14.6111^{o}S 132.5749^{o}E
Land System: Blain
Geomorphic Context: Plains
Method of Discovery: Vehicle transect
Ground surface visibility %: Average-100%
Site location: The railway line is in open woodland and grassed plain approximately 20 metres west of the Stuart Highway.
Site description: All that remains of the railway line at this location is the 50 cm high gravel bed on which the tracks were placed. Also in the area are broken 1950s ceramic electric insulators and old railway bolts and nuts.
Relationship to proposed pipeline: The pipeline will cross over the old railway line and be destroyed in this area.
Archaeological significance: While the North Australian Railway line was an important feature in the development of the Top End and consequently has a high historic significance, the remains of the railway line where the pipeline crosses consists only of the gravel bed on which the line was placed. Therefore the line in this area has low to moderate historic and archaeological significance.

Site 23, facing north

Site 24
Stone Artefact Scatter 13
Location: 53 616351E 8595460N Durabudboi 6172 1:100,000 map sheet
-12.7031°S 136.0716°E
Land System: Keating
Geomorphic Context: Creek
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum-98%, Minimum-80%. Average-90%
Site location: The site is on a lateritic gravel surface that slopes gently down to an ephemeral creek (a tributary of Richard River) in an area of closed forest that had been recently burnt.
Site description: This site is a low density artefact scatter with eleven stone artefacts The artefacts were concentrated on the upper slope of a small rise and 20 metres north of the creek. All the artefacts were very weathered and consisted of 90% unretouched flakes and 10% flaked pieces. All but two of the artefacts were made from a fine grained sedimentary rock that were smaller in size (average length 20mm) than those made of silcrete and siltstone (42mm long).
Site dimensions: 10 x 8 metres
Artefact densities: Maximum: 4/m^2, Average: 0.15/m^2
Relationship to proposed pipeline: Site 24 is 60 metres from the proposed pipeline route revision 7 and may be disturbed by the development**.**
Archaeological significance: As this is a small site with a low density and diversity of stone artefacts the site has a low archaeological significance.



Site 25.
Overland Telegraph Pole

Location: 53 244176E 8384036N Maranboy 5468 1:100,000 map sheet
-14.6048°S 132.6253°E

Land System: Woggoman

Geomorphic Context: Plain

Method of Discovery: Vehicle transect

Site location: The Overland Telegraph Pole is located in closed woodlands with an understorey of tall grass and is approximately 300 metres north of the King River Station Road.

Site description: Only one pole made from the Oppenheimer design was located. There were two strands of wire still attached and they appeared to be running in a north south direction.

Relationship to proposed pipeline: Site 25 is 260 metres north of the pipeline of the proposed pipeline route revision 7 and will not be disturbed by the development..

Historic significance: This isolated pole is unusual in that it does not appear to be located along the main route of the Overland Telegraph line. The Oppenheimer pole may not be related to the original line which is thought to have been located west of the North Australian Railway line in the area south of Katherine The line was perhaps related to a subsidiary line that was constructed between Katherine and Maranboy in 1920s as the wire was facing in a north south direction. If the line was a spur line from the main line it would most likely be in an east west direction. Therefore the pole is deemed to have medium to high historic significance as it is associated with events and developments in human occupation in the Top End.

Site 26
Stone Artefact Scatter 14

Location: 53 464023E 8513730N Annie Creek 1:100,000 map sheet
-13.4441^{0}S 134.6677^{0}E

Land System: Flatwood

Geomorphic Context: Ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum- 70 %, Minimum- 20 %. Average- 60 %

Site location: Ten metres east of a tributary creek of Annie Creek in open woodlands on a grassy sandy plain

Site description: The low density artefact scatter is located next to a bend in the creek. There is also a relatively high density of isolated stone artefacts that were found along the banks of the creek and on the stony creek bed where there was no water. The source of the raw material for the artefacts appeared to be from stones found in the creek bed and eroded areas along the creek bank.

The majority of artefacts identified were unretouched chert flakes with an average length of 60mm. There were also two silcrete and four mudstones unretouched flakes. The four cores were also manufactured from chert.

Site dimensions: 11m x 10m

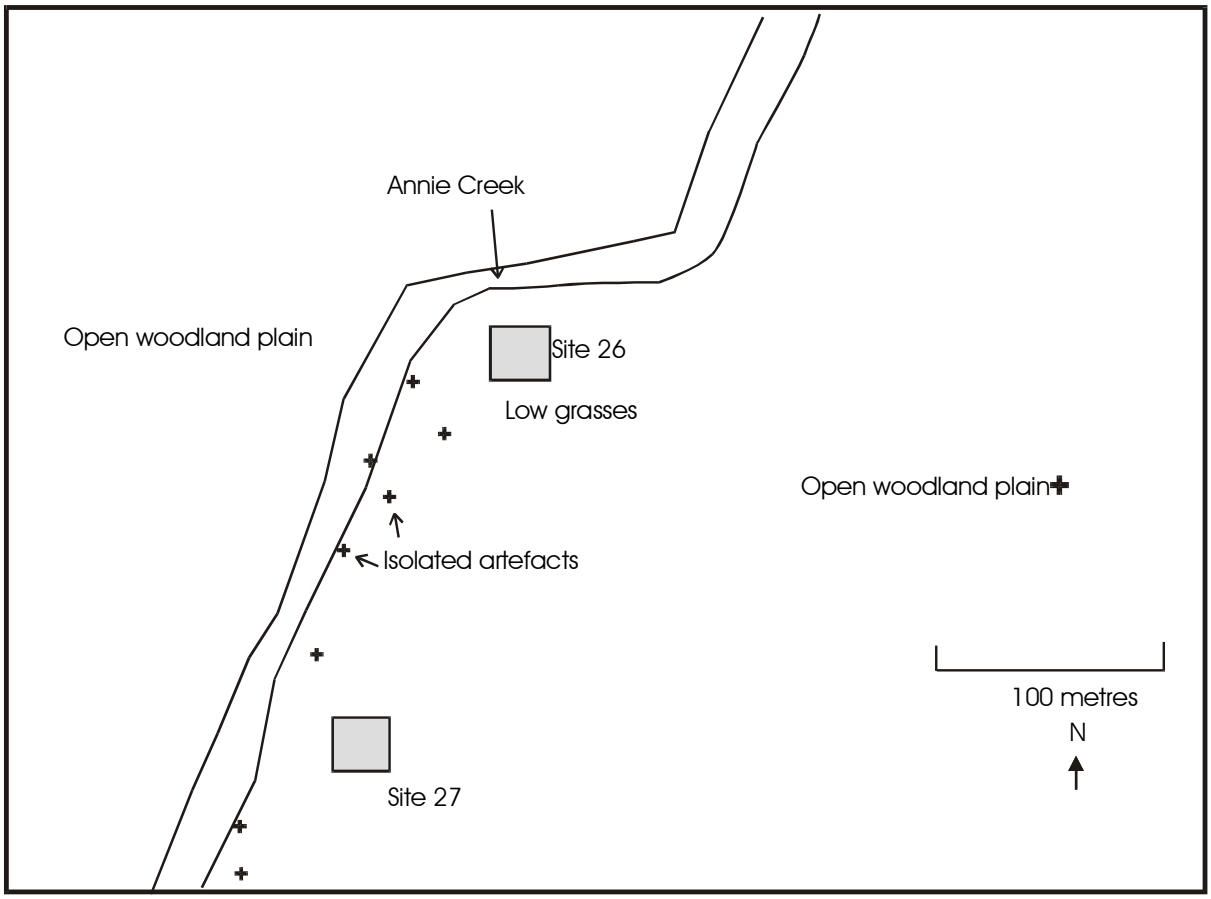
Artefact densities: Maximum: 6 /m^2, Average: 0.3 /m^2

Artefact dimensions (length): Maximum: 39mm, Average: 35mm

Relationship to proposed pipeline: This site is 140 metres from the proposed pipeline route revision 7 and is not expected to be impacted by the development.

Archaeological significance: This small low density artefact scatter with a variety of raw material and artefact types is located in an area where the background scatter was high along the creek bank**.** Therefore the site and adjacent areas along the creek has research potential associated with stone tool manufacture and procurement and consequently the site is assessed as having moderate archaeological significance.

Site 26, facing west



Site 27, facing north.

Site 27
Stone Artefact Scatter 15

Location: 53 464217E 8513518N Annie Creek 5871 1:100,000 map sheet
-14.4459 ^{0}S 134.6680 ^{0}E

Land System: Flatwood

Geomorphic Context: Ephemeral creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-80%, Minimum-40%. Average-60%

Site location: The artefact scatter is located 100 metres south of Site 26 on the same side of the creek in an area of level sandy grassy plain with open woodlands

Site description: The site is located 20 metres from the creek in an area that was not heavily grassed. The majority of artefacts were located in an area of 2 x 2metres and were manufactured from chert with one mudstone and one quartz unretouched flake. There was one chert retouched flake and three chert cores.

As mentioned in Site 26 there appears to be a high density of background scatter along the banks of the creek. Four chert flakes and one chert core were located between sites 26 and 27 and another four chert flakes and one retouched chert flake were located within 50 metres south of Site 27.

Site dimensions: 5 x 5m

Artefact densities: Maximum: 12 /m^2, Average: 0.6/m^2

Artefact dimensions (length): Maximum: 90 mm, Average: 35 mm

Relationship to proposed pipeline: This site is 60 metres from the pipeline alignment and may be disturbed during the development.

Archaeological significance: This small low density artefact scatter with a variety of raw material and artefact types is located in an area where the background scatter was high along the creek bank**.** Therefore the site and adjacent areas along the creek has research potential associated with stone tool manufacture and procurement and consequently the site is assessed as having moderate archaeological significance.

For sketch map see Site 26.

Site 28
Stone Artefact Scatter 16

Location: 53 464021E 8513499N Annie Creek 5871 1:100,000 map sheet
-13.4462^{0}S 134.6671^{0}E

Land System: Flatwood

Geomorphic Context: Billabong

Method of Discovery: Vehicular transect

Ground surface visibility %: Maximum-95%, Minimum-50%. Average-70%

Site location: The site is located on the north east side of a billabong and adjacent to the eastern banks of Annie Creek. Open *Melaleuca* woodlands and sandy soils surround the area.

Site description: The site dimensions are defined by an area where sand has been washed away from the gently sloping banks of the creek uncovering an area of rocks along the sides of the creek. There is a high proportion of orange chert cores (50%) and the flakes are all manufactured from the same coloured chert. There was one retouched flake. The distribution of artefacts was evenly distributed across the site.

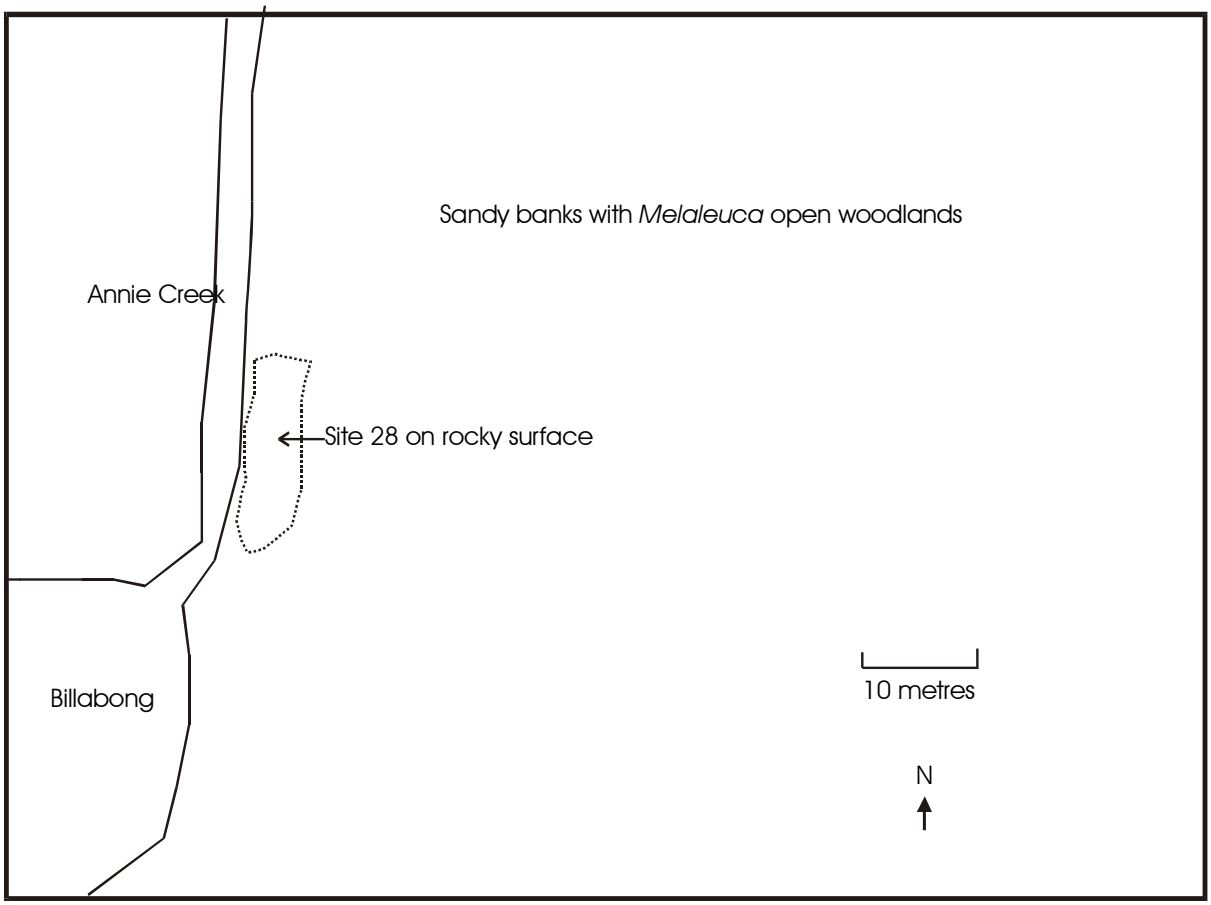
Site dimensions: 21m N-S x 6m E-W

Artefact densities: Maximum: 6 /m^2, Average: 0.2 /m^2

Artefact dimensions (length): Maximum: 120 mm, Average: 90mm, Minimum 24mm

Relationship to proposed pipeline: This site is 20 metres from the proposed pipeline route revision 7 and will be disturbed or destroyed during the construction of the pipeline.

Archaeological significance: This site appears to be highly disturbed as the artefacts are all located in an area where the surface would be removed during the flooding of the creek. The sandy banks have been completely removed leaving the stone artefacts visible on the rocky and stony bank and bed of the creek. The high proportion of cores and the size of the large flakes suggest that the raw chert material was located in the vicinity. However the rocks on which the artefacts were found were not the source of the chert raw material. As the artefacts do not appear to be in situ and have been possibly washed down the creek during the wet season the small artefact scatter is considered to have low archaeological significance.



Artefacts from Site 28

Site 29
Stone Artefact Scatter 17

Location: 53 431008E 8483982N Marumba 5770 1:100,000 map sheet
-13.7124^{0}S 134.3619^{0}E

Land System: Favenc

Geomorphic Context: Steep stony hill

Method of Discovery: Vehicle transect

Ground surface visibility %: Maximum- 100%, Minimum-95%. Average-98%

Site location: The stone artefact scatter is located 50 metres south of an ephemeral creek and approximately a quarter of the way up a steep stony sandstone hill on a level area that overlooks the plains and the Wilton River. The hill is covered in open woodlands that had been recently burnt.

Site description: There was a low density artefact scatter on the level area of the hill slope with only one concentration of artefacts 10 metres from the edge of the slope in an area of 2 x 2 metres. The other artefacts were located along the edge of the level ground. The surface of the area was covered in small sandstone rocks.

The artefacts consisted mostly of flakes manufactured from a highly weathered fine grained sedimentary rock, possibly siltstone. There was a unifacial white chert point broken laterally (58 x 28 x 5mm) and one white chert core (20 x 15 x 20mm).

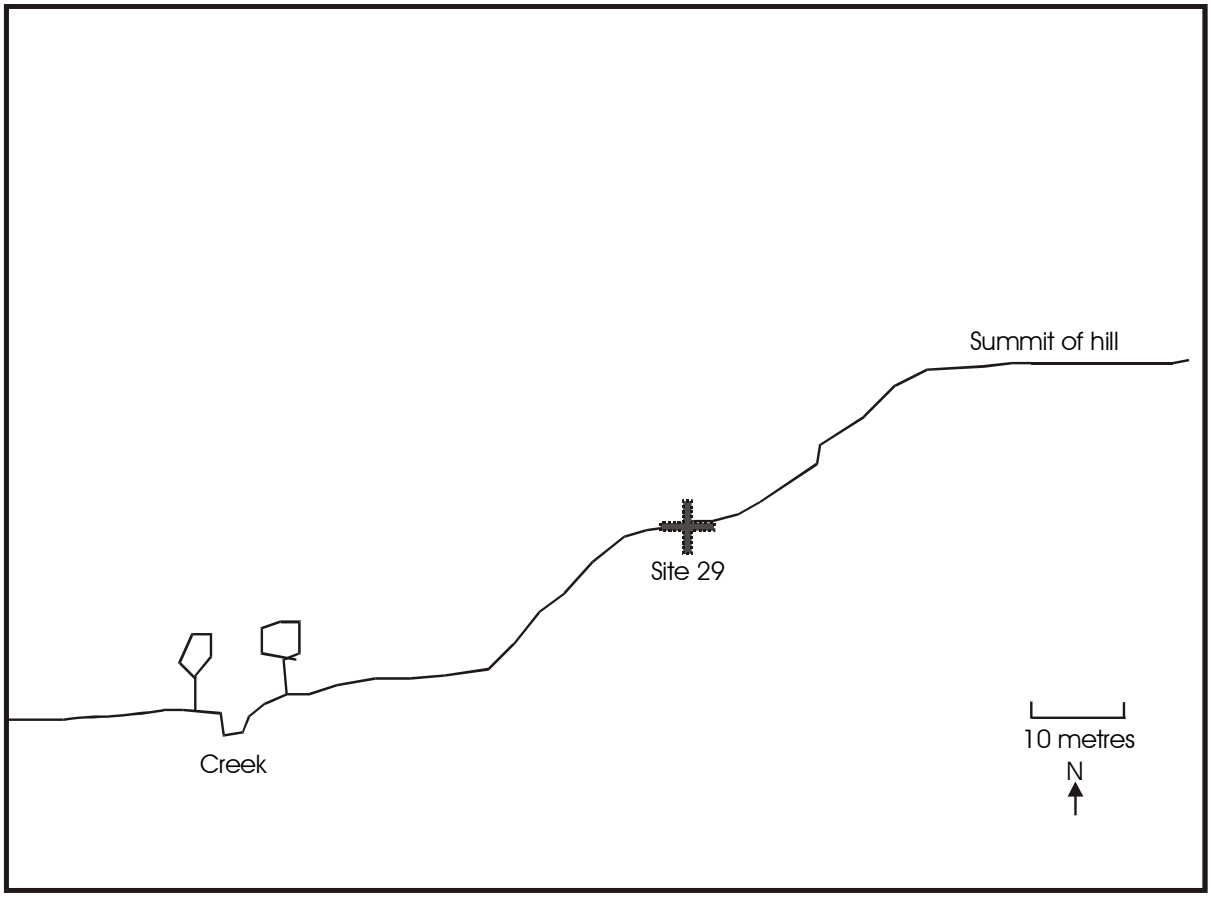
Site dimensions: 10m x 5m

Artefact densities: Maximum: 4/m^2, Average:0.05/m^2

Artefact dimensions (length): Maximum: 58mm, Average: 30mm

Relationship to proposed pipeline: This site is 50 metres from the proposes pipeline and will not be disturbed as it is located half way up a steep hill and the pipeline is located at the bottom of the slope.

Archaeological significance: As this site has a low diversity and density of artefacts it is considered to have a very low research potential and consequently low archaeological significance.



Site 30
Stone Arrangement 2
Location: 53415716E 8469775N Marumba 5770 1:100,000 map sheet
-13.84025^{0}S 134.2201^{0}E
Land System: Flying Fox
Geomorphic Context: Large quartzite outcrop
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum-100%, Minimum-95%. Average-95 %
Site location: The site is located on the top of a large quartzite outcrop that is approximately 5 metres high and covers an area of several 100 square metres and surrounded by open woodlands and undulating plains.
Site description: A stone cairn was located on approximately the highest point of the quartzite outcrop on a level and smooth area in the southern most section of the summit of the outcrop. The cairn covered an area of 1 x 1metres and was 0.5m high. The stone appeared to have been gathered from the sides of the outcrop. No stone artefacts were located in the area.

Relationship to proposed pipeline: The pipeline will not disturbed the stone arrangement as it is located on the summit of a quartzite outcrop and the pipeline is located 200 metres away from the proposed pipeline route revision 7on an undulating plain.
Archaeological significance: This site is considered to have moderate to high archaeological significance based on its rarity alone.
Site 30, facing west

Site 31
Stone Artefact Scatter 18

Location: 53 411326E 8465836N Marumba 5770 1:100,000 map sheet
-13.8760 ^{0}S 134.1794 ^{0}E

Land System: Lindsay / Coolibah

Geomorphic Context: Creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-60%, Minimum-5%. Average-30%

Site location: The site is located on northeast bank of Horse Creek near a bend in the creek. The banks are covered in dense grass and isolated trees. The surface consists of black soils with many small sandstone rocks.

Site description: The stone artefacts were located approximately 10-15 metres from the creek on the upper sections of a gentle slope that leads into a small wide gully that runs into the creek. All the artefacts were manufactured from dolerite and there was no concentration of artefacts in the area. Two of the flakes were retouched and there was one core flake (81 x 46 x 26mm). There were also several tips from broken points. Given the low ground visibility possible that the site has a much higher density of artefacts. The site appears to be in a relatively stable area and does appear to have suffered from too much erosion or gullying.

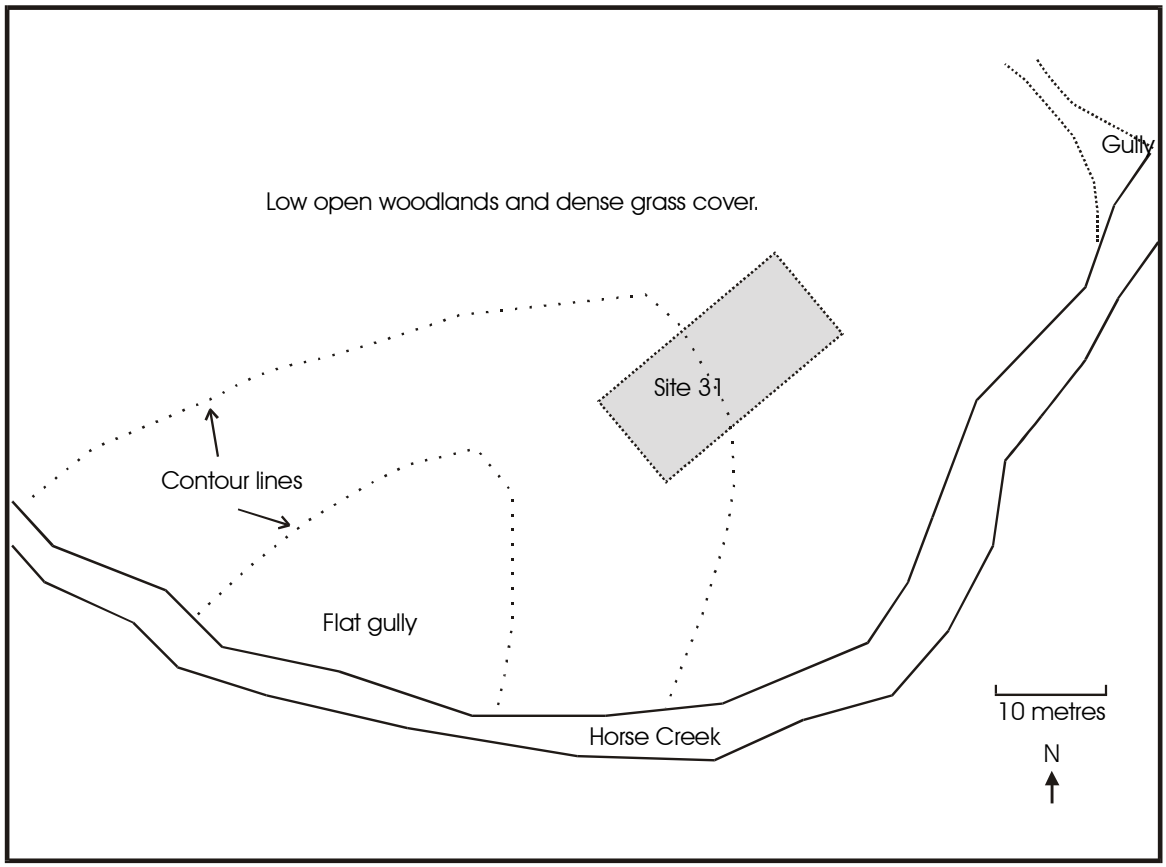
Site dimensions: 15m NS, 20m EW

Artefact densities: Maximum: 4/m^2,Average: 0.2 /m^2

Artefact dimensions (length) Maximum: 81 mm, Average: 45mm

Relationship to proposed pipeline: This site is 180 metres from the proposed pipeline route revision 7 and is not expected to be disturbed by the development.

Archaeological significance: The site appears to be relatively intact and is unusual in that it contains cores, retouched and unretouched flakes made from only one raw material, dolerite. Consequently the site has the potential for researching both the use and the manufacture of the dolerite artefacts. This site also appears to have a good potential for excavation as the artefacts are located on the top and sides the creek banks. Therefore site 31 is considered to have a moderate to high archaeological significance.



Site 31, facing east

Site 32
Stone Artefact Scatter 19

Location: 53 409852E 8465830N Marumba 5770 1:100,00 map sheet
-13.8760 ^{0}S 134.1657 ^{0}E

Land System: Lindsay / Coolibah

Geomorphic Context Creek

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-90%. Average-95 %

Site location: The site is located on the eastern side of Horse Creek in one of several areas along the creek that have been eroded by sheet wash and disturbed by animals

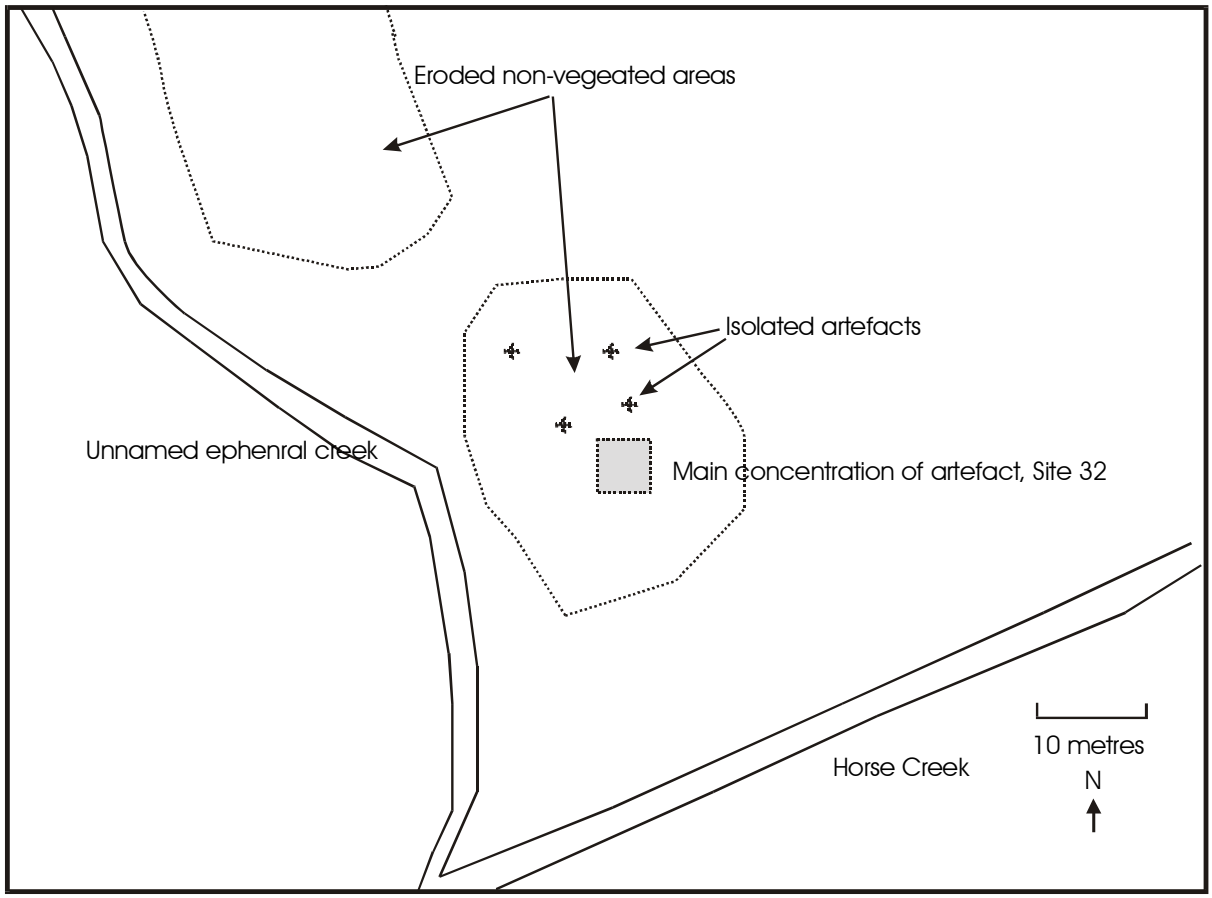
Site description: The artefacts are eroding out of a open sandy sheet 25 metres from Horse Creek and 5 metres from a small ephemeral creek that runs into Horse Creek.. Visibility was less than 5% on areas where there was no erosion. The stone artefacts were only located in the one of the eroded areas in a concentration of artefacts 4 x 4 metres. Eighty percent of the artefacts were flakes and twenty percent were cores. The majority were manufactured from dolerite with smaller proportions of chert and siltstone. There were 2 bifacial points made of chert and dolerite.

Site dimensions: 15m NS & 5m EW

Artefact densities: Maximum: 7/m^2, Average: 0.1 /m^2

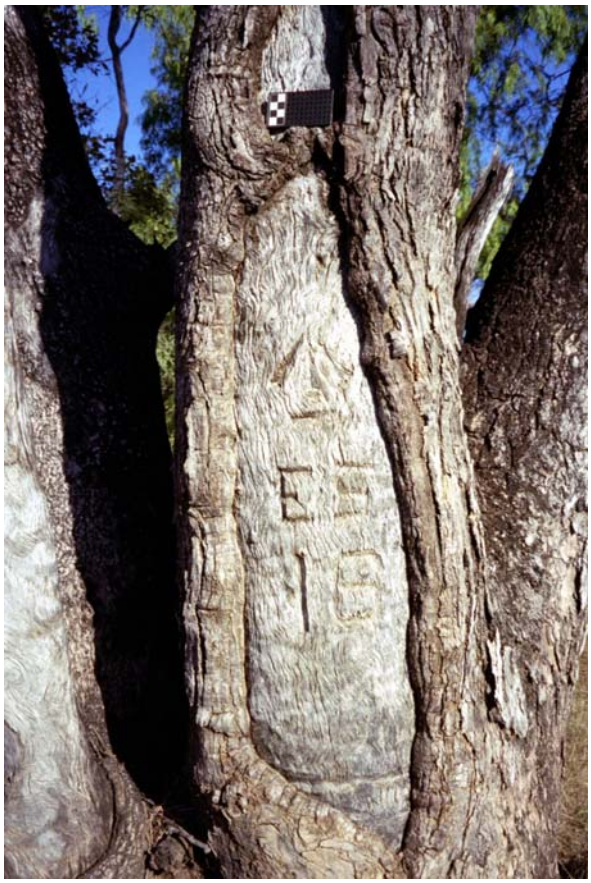
Relationship to proposed pipeline: This site is one kilometre west of the proposed pipeline route revision 7 and is not expected to be disturbed by the development.

Archaeological significance: As this site has been disturbed by erosion and animal tracks and there is a very low density of artefacts the site has little potential for contributing to archaeological research and consequently is considered to have a low level of archaeological significance.



Site 32, facing north west

Site 33



Site 33
Marked Tree 1

Location: 53 342068E 8403510N Flying Fox 5569 1:100,000 map sheet
-14.4364^{0}S 133.5349^{0}E

Land System: McArthur

Geomorphic Context: Plains, near ephemeral creek

Method of Discovery: Information supplied by Ian Johnstone

Ground surface visibility Average: 10%

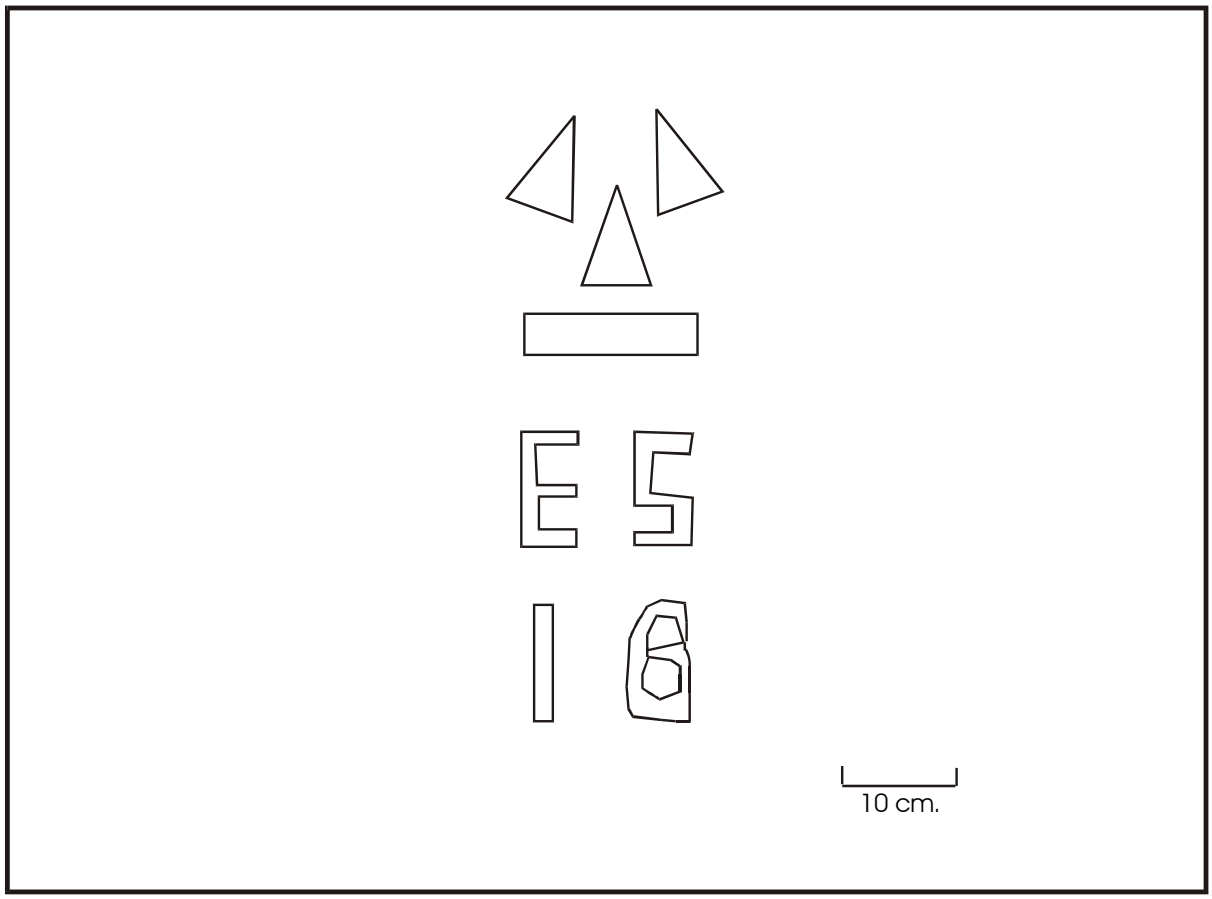
Site location: The tree is located 30 metres west of Bukalorkmi Creek in open woodlands and dense grass in an area that floods

Site description: On the NNW side of a *Eucalyptus tectifica* is an area where the bark has been removed and marked with an arrow type design on the top, ES in the middle and on the bottom below IB or possibly I8 or I6. The inscription is 14cm wide and 40cm long.

Ian Johnstone who pointed out the site to the survey members had discovered that the tree was marked in the early 1970s by surveyors as a national mapping third order levelling point.

Relationship to proposed pipeline: This site is located 1.2 kilometres north of the proposed pipeline alignment of the proposed pipeline route revision and will not be disturbed by the development.

.Archaeological significance: While this site is relatively recent, there is moderate historic significance in that the method of marking trees as a recording point for surveyors has not been used since the more technologically sophisticated ways of marking survey points have become available.



Site 34
Manbulloo Airstrip 2

Location: 53 196311E 8386993N Manbulloo 5368 1:100,000 map sheet
-14.5732^{0}S 132.1816^{0}N

Land System: Tagoman

Geomorphic Context: Low rocky ridge

Method of Discovery: Pedestrian transect

Ground surface visibility %: Average-50%

Site location: The site is located one hundred metres south of the Victoria Highway and approximately three hundred metres east of the track the goes south to the airstrip. A fence runs south of the highway is approximately twenty metres to the west of the site.

Site description: There are three main features that make up this site and they are located on a low ridge lying parallel to the highway. The most western feature (Feature 1) consists of a concrete floor 5 x 5 metres with the remains of corrugated iron sheets around the edge of the floor and a metal frame 0.7 x 1.8 x 0.03m located in the centre edge of the western floor with one lead pipe with electrical wires attached. In the centre of the floor are two concrete blocks, 1.9 x 0.7 x 0.2m with twelve bolts embedded into both blocks On the northwest corner of each block there is a threaded galvanised pipe poking up 10 cm above the top of the blocks. There also appeared to be two entrances on the eastern side of the north wall and the southern end of the east wall. Both are made of a concrete slope.

45^0 and approximately 11 metres away from Feature 1 is a floor (Feature 2) made of flat sandstone rocks held together with a roughly made concrete. This floor measures 2 x 1.5 metres.

East of this floor appeared to be an area that had been cleared and levelled and 26 metres and 150^{0}from this cleared area, is a large excavated area (Feature 3) with stone retaining walls around three sides, steps in the north east corner and a concrete and earth sloping floor in the south. The dimensions of this structure are 18.2 x 6 x 2.2 metres.

Approximately 40 metres and 40^0 from Feature 3 is small concrete floor (Feature 4) with a sloping concrete entrance and two pipe holes made in the outside of the concrete floor. The dimensions of this floor are 2.3 x 2.3 metres and there are two concrete strips around the edge of the concrete block 10 cm above the floor and 22 and 8 centimetres wide.

Site dimensions: 120m E-W and 40m N-S

Relationship to proposed pipeline: The pipeline is approximately two kilometres south of proposed pipeline route revision 7 and will not be disturbed by the development.

Significance; This is a section of the Manbulloo airstrip had not been previously identified. However the site has now been mapped in detail by Bob Alford from the Heritage Advisory Council. This site provides information contributing to a broader understanding of World War II activities in the region and is assessed as having high historic significance even though the site has not been declared place under the NT Heritage Conservation act 1991.

For sketch map see Site 15.

Site 35
Rock Shelter 4

Location 52 738748E 8396788N Jindare 5169 1:100,000 map sheet
-14.4912^{0}S 131.2152^{0}E

Land System: Mullaman

Geomorphic Context: Escarpment edge

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum-100%, Minimum-60%. Average-95%

Site location: The site is located on the eastern edge of the escarpment on the plateau of the Wingate Mountains approximately 12kKilometres west of Bradshaw Creek

Site description: The southeast facing rockshelter is located halfway down a steep rocky slope adjacent to a gully. The floor of the shelter has been highly disturbed by animals and the maximum depth of the deposit is 50 centimetres. There is a stone line one metre in length made of single stones that separates the rocky front section of the western side of the shelter from the area of sandy deposit. Three of the stones in the stone line are large siltstone cores. In the centre of the shelter are two large rocks approximately 75 centimetres high that contained six drill holes measuring 2 to 3 centimetres in width and approximately one centimetre deep. Sections of the upper areas of the two rocks appeared to be polished.

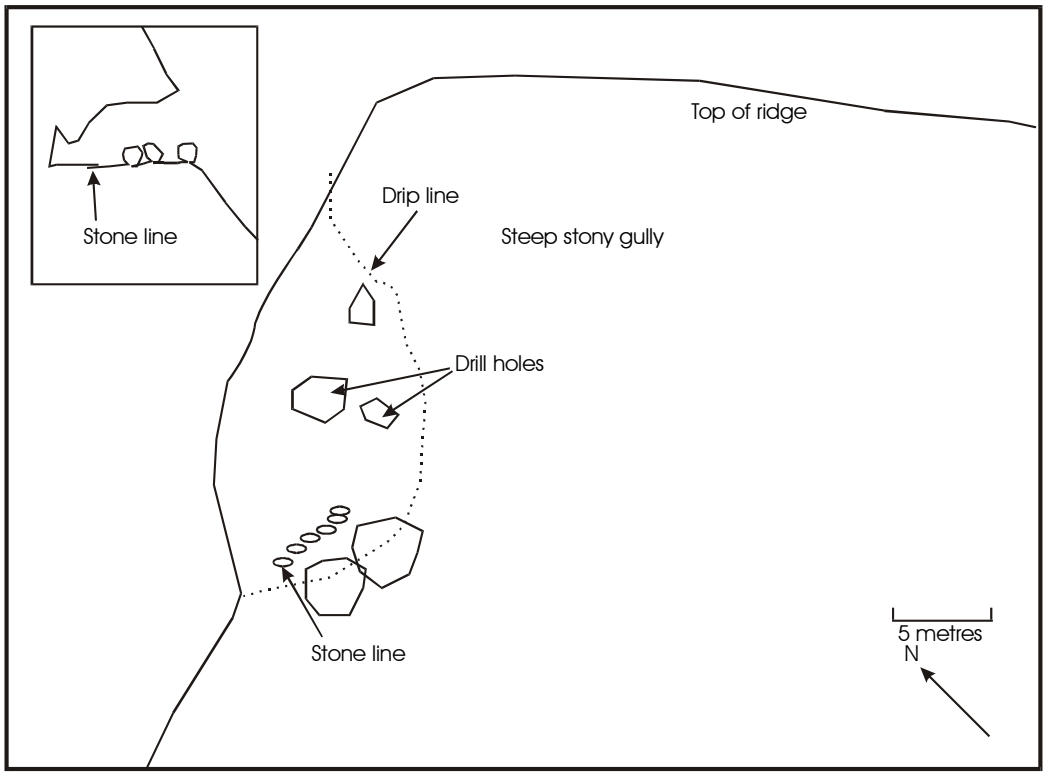
There is a low density of stone artefacts manufactured from siltstone and chert in equal proportions located adjacent to the rocks in front of the shelter. The average length of the flakes is 55mm for the siltstone and 25mm for the chert flakes. None of the flakes had been retouched. One edge ground axe measuring 110 x 70 x 30 mm with only one point that had been ground was located outside the shelter on the edge of the rocky slope.

Site dimensions: 12 x 5 x 3

Artefact densities: Maximum: 3/m^2, Average: 0.2/m^2

Relationship to proposed pipeline: This site is 200 metres south of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: Even though the site has only a small potential for obtaining chronological data through excavation the site is unusual in that it contains stone lines, drill holes as well as stone artefacts indicating the site was used for a variety of functions. Therefore this site is given high archaeological significance on rarity alone.



Site 36
Stone Artefact Scatter 20

Location: 52 740671E 8397464N Jindare 5169 1:100,000 map sheet
-14.4850^{0}S 131.2529^{0}E

Land System: Mullaman

Geomorphic Context: Creek bank

Method of Discovery Pedestrian transect

Ground surface visibility %: Maximum- 95%, Minimum- <5%. Average- 60%

Site location: The site is located 30 metres south of an ephemeral creek on the lower gentle slopes of the eastern side of the Wingate plateau approximately 10 kilometres west of Bradshaw Creek.

Site description: The artefacts are located in three adjacent areas on a gentle red earth slope that has been eroded by sheet wash in an area of open woodlands. The surface outside the eroded areas was covered in thick grass at the time of the survey. Several stone artefacts were also located on an adjacent slope 20 metres to the east on a similar eroding surface. The stone flakes were concentrated on the lower sections of the eroding slope where there was also a quartzite core measuring 128 x 130 x 38mm. The majority of artefacts were manufactured from chert with smaller proportions of quartzite and silcrete. There was one retouched flake, 2 quartzite cores and the remainder were unretouched flakes.

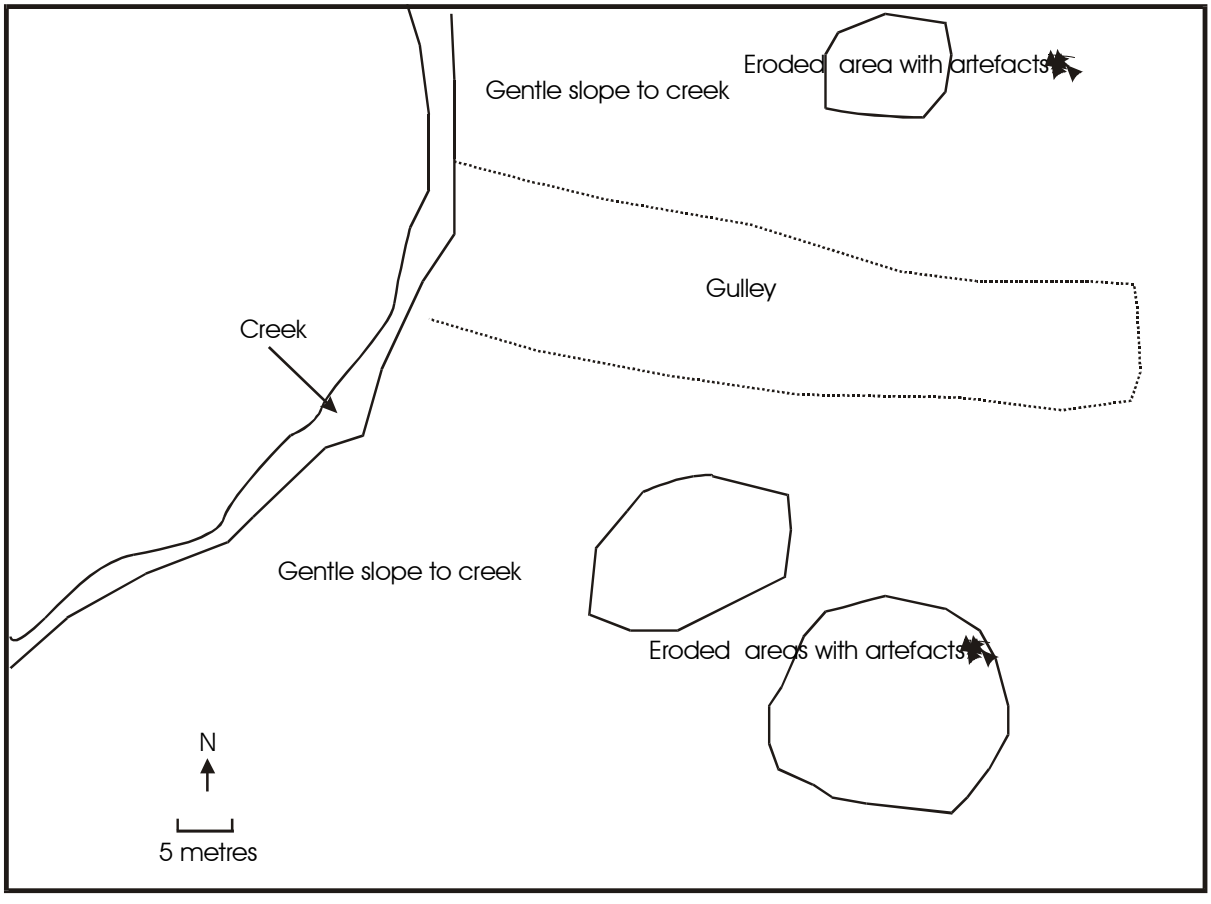
Site dimensions: 20 x 5m

Artefact densities: Maximum: 6/m^2, Average: 0.2/m^2

Artefact dimensions (length): Maximum: 47mm, Average: 30mm

Relationship to proposed pipeline: This site is 75 metres from the proposed pipeline route revision 7and is not expected to be disturbed by the development.

Archaeological significance: Moderate to high as there are areas that have been disturbed by sheet wash and gullying although site may have the potential for excavation away from the eroded areas.



Site 36, facing north

Site 37, facing east

Site 37
Rock Shelter 5

Location: 52 691522E 8401618N Wingate 5069 1:100,000 map sheet
-14.4513^{0}S 130.7768^{0}E

Land System: Mullaman

Geomorphic Context: Top of escarpment

Method of Discovery: Pedestrian transect

Ground surface visibility %: Maximum- 100%, Minimum-100%. Average-100%

Site location: The site is located on the northern edge of the Wingate Mountains on top of a steep slope overlooking a valley that has an ephemeral creek at the base of the slope.

Site description: The site consists of three small rock shelters 25 metres apart. The majority of artefacts were located on the steep slope in front of the middle and larger rock shelter that measured 20 x 3 x 2m. No artefacts were located inside any of the rock shelters as the area inside the middle rock shelter and on the steep slope in front of the shelters has been highly disturbed by donkeys who have entered the shelter to lick or bite away the surface of the shelter and have left well trodden tracks on the surface inside the shelter and along the steep slope in front of the shelters. The majority of stone artefacts are located on the very steep slopes in front of the middle rock shelter. In sections where there are no donkey tracks artefacts can be seen a metre below the surface. The dimensions of the site given below are for the slope area outside the larger shelter.

The type of raw material used was diverse and consisted of quartz 20%, chert 20%, siltstone 10%, silcrete 10%, quartzite 10% and dolerite 30%. Only two cores were identified and 10% of the flakes were retouched. There was an unusual quartzite ground stone that also had hammer marks on the surface and a small smooth cylindrical stone ().

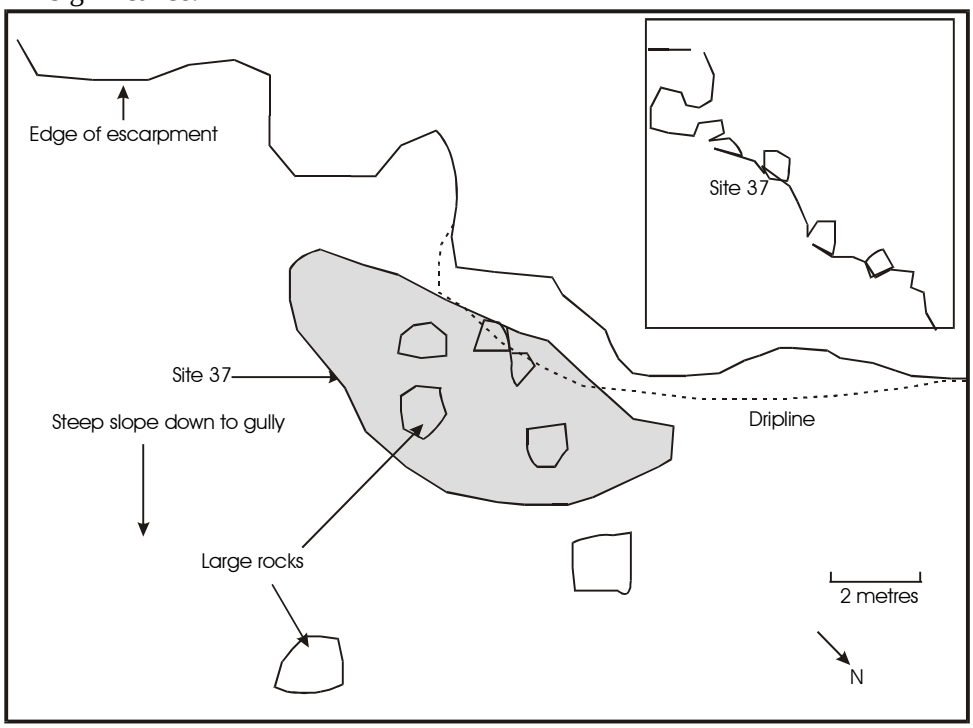
Site dimensions: 20 x 10m

Artefact densities: Maximum: 25/m^2, Minimum: 5/m^2, Average: 10/m^2

Artefact dimensions (length): Average: 35 mm

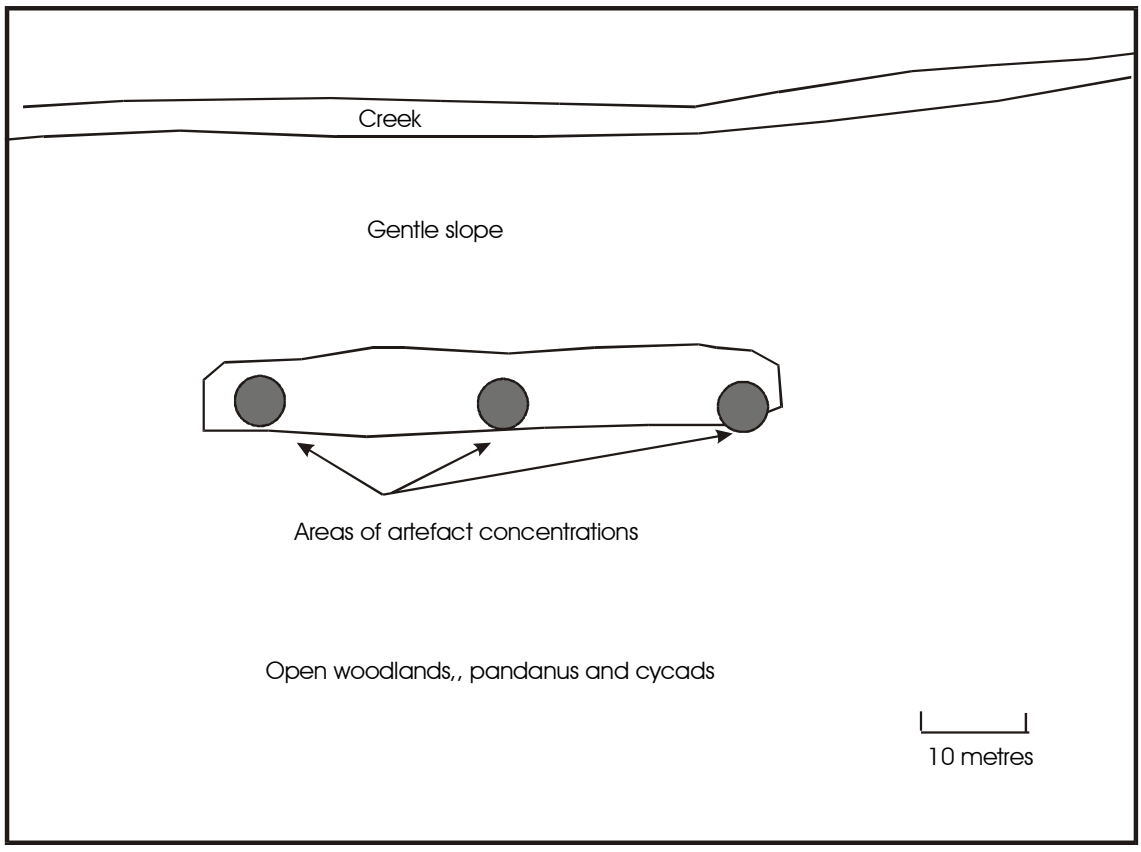
Relationship to proposed pipeline: This site is 880 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: As this site has a high density and diversity of artefacts and there is a high potential for excavations to obtain chronological data the site possesses a high archaeological significance.

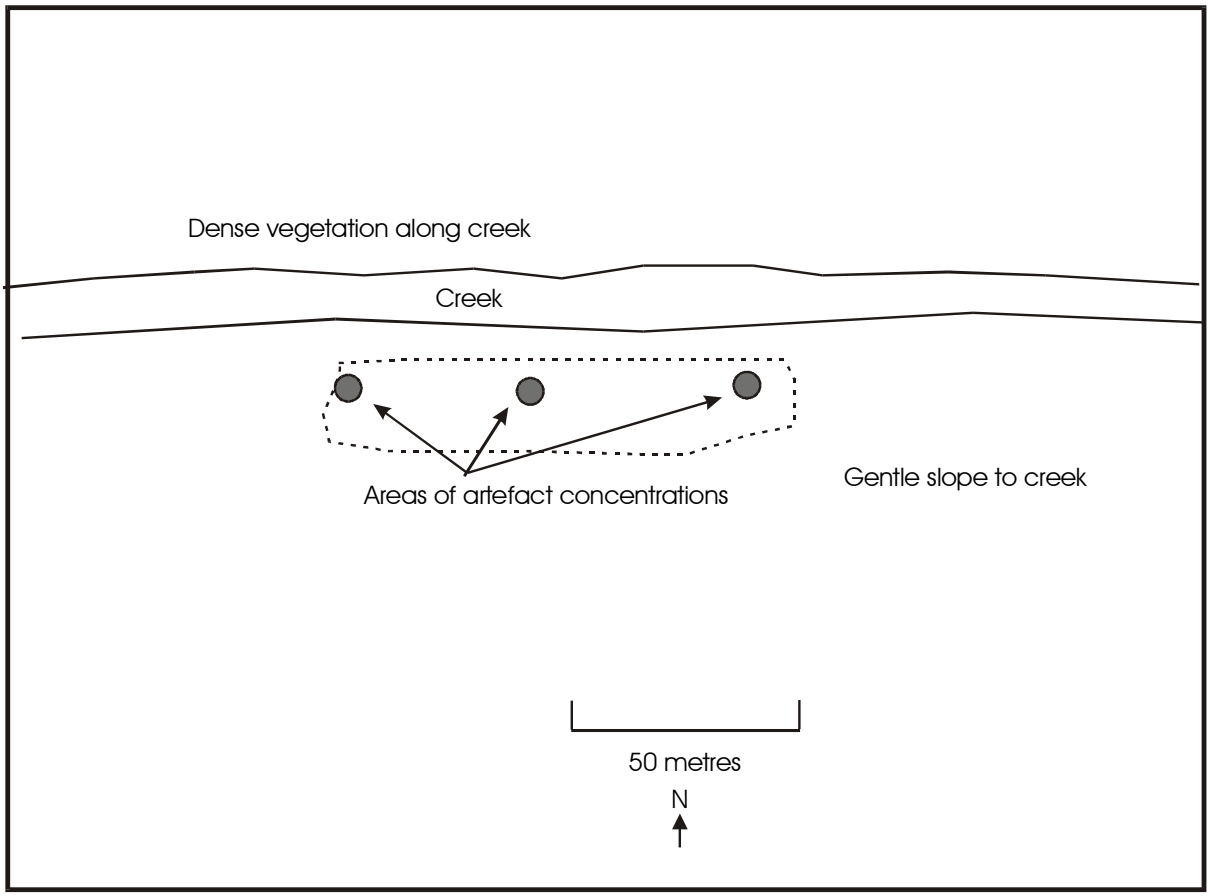


Site 37a
Stone Artefact Scatter 21
Location 52 652108E 8414380N Moyle 4969 1:100,000 map sheet
-14.3384^{0}S 130.4105^{0}E
Land System: Wingate
Geomorphic Context: Creek bank
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum-40 %, Minimum-5%. Average-10%
Site location: The site is located in the middle of the Wingate plateau on the western side of a creek that appears to be spring fed and is a tributary of the Moyle River.
Site description: The artefacts are eroding out of sandy soil on a gentle slope that is covered in open woodlands, pandanus and palms. The area has been affected by sheet wash and the area is inundated during the wet. The majority of artefacts were located in three areas on a slightly steeper slope approximately 20 metres from the creek. The average artefact density in the areas of artefact concentrations is 0.5/m^2. There was a lower artefact density between the three concentrations.

The artefacts consisted of 80% unretouched flakes 5% retouched flakes and 15% cores and were manufactured from either quartzite or silcrete. There were several blade flakes 40cm long that had been retouched along one lateral edge and four of the cores retained some cortex. A large silcrete core with two large flake scars made from a round river cobble (82 x 34 x 34mm) was located under water approximately 200 metres down stream from the site.
Site dimensions: 50 x 5m
Artefact densities: Maximum: 9/m^2, Average: 0.1 /m^2
Artefact dimensions (length): Maximum: 88mm, Average: 35-40mm
Relationship to proposed pipeline: This site is 880 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.
Archaeological significance: This site has moderate archaeological significance as there is a wide variety and diversity of artefacts that can be used to understand stone artefact reduction sequences and procurement in the area.



Site 38
Stone Artefact Scatter 22
Location: 52 650893E 8414878N Moyle 4969 1:100,000 map sheet
-14.3340^{0}S 130.3992^{0}E
Land System: Wingate
Geomorphic Context: Creek bank
Method of Discovery: Pedestrian transect
Ground surface visibility %: Maximum- 20%,
Site location: The site is located approximately 1.5 kilometres north and down stream of Site 37a in the middle of the Wingate plateau
Site description: Artefacts are located along 100 metres of the creek in dense riparian vegetation. There are three areas of higher artefact concentration within this area. The site is located approximately 10 metres from the creek's edge on a gentle slope that has evidence of flooding during the wet season. Some of the artefacts were found semi-buried in the silt. Ninety percent of artefacts were manufactured from quartzite and the remainder from silcrete. The majority of artefacts were unretouched flakes and the remainder consisted of 5% cores and 5% retouched flakes including 2 bifacial points
Site dimensions: 100 x 30m
Artefact densities: Maximum: 14/m^2,
Artefact dimensions (length): Maximum: 240mm, Minimum: 43,
Relationship to proposed pipeline: This site is 890 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.
Archaeological significance: This site is similar to site 37a has moderate archaeological significance as there is a wide variety and diversity of artefacts that can be used to understand stone artefact reduction sequences and procurement in the area.



Site 39
Quarry 3

Location: 52 645434E 8416325N Moyle 4969 1:100,000 map sheet
-14.3212^{0}S 130.3485^{0}E

Land System: Wingate

Geomorphic Context: Low quartzite outcrops next to creek

Method of Discovery: Vehicular transect

Ground surface visibility %: Maximum-70%, Minimum-10%. Average-60%

Site location: The site is located on the eastern side of a tributary to the Moyle River on the Wingate Mountains. The western side of the creek is extremely boggy.

Site description: The area is vegetated in open woodlands and grass and the surface is covered in silty sands and would be flooded during the wet season. There are five low quartzite outcrops that have been quarried within 50 metres of the creek. Isolated artefacts are located 240 metres up a long gentle slope away from the creek with the density of artefacts decreasing with distance away from the quarried areas. The artefact densities given below refer to the areas around the quartzite outcrops. Average artefact density between the concentrations is 0.2/m^2.

There was one small silcrete core (40 x 52 x 28mm) and the remaining artefacts were quartzite cores and flakes. The largest core measured 250 x 200mm and was too large to extract from the soil. No retouched flakes were identified during the survey.

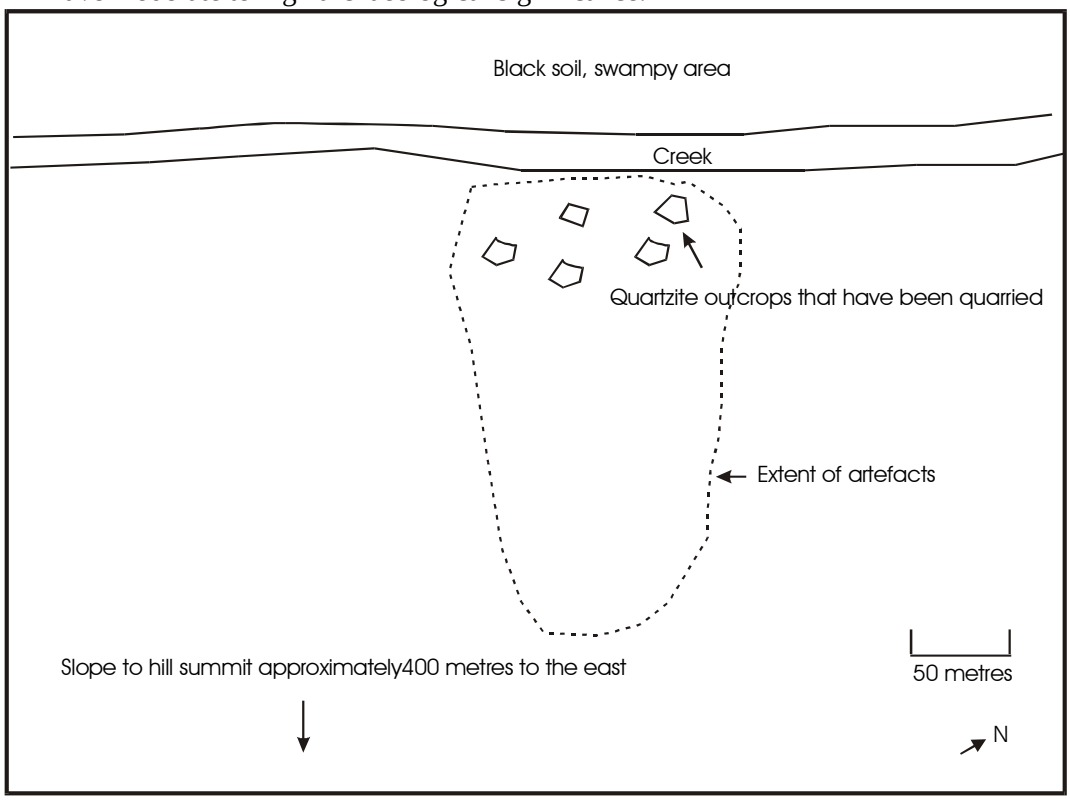
Site dimensions: 240 x 140m

Artefact densities: Maximum: 60/m^2, Average: 40/m^2

Artefact dimensions (length) Maximum: 148mm, Average: 65mm

Relationship to proposed pipeline: This site is located 300 metres north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance This quarry and Site 40, also a quarry, are located in an area that has had no archaeological research carried out and therefore any sites located in this area will have a moderate significance assessed on rarity alone. While sections of the quarry that are located near the creek may have areas that have been disturbed by flooding the site still has the potential to contribute knowledge concerning stone procurement and reduction technologies and is deemed to have moderate to high archaeological significance.



Site 39, close up of a quarry area

Site 40
Quarry 4

Location: 52 634806E 8421746 N Moyle 4969 1:100,000 map sheet
-14.2727^{0}S 30.2497^{0}E

Land System: Wingate

Geomorphic Context: Low quartzite outcrops next to creek

Method of Discovery: Vehicular transect

Ground surface visibility %: Maximum-85%, Minimum-20%. Average-70%

Site location: Adjacent to the southern banks of a tributary to the Moyle River on the Wingate Mountains on undulating terrain.

Site description: The quarry is located over nine low quartzite outcrops that lie half way up a gentle slope that rises from the creek in an area covered in open woodlands and sandy, silty soils. Cores and large flakes were also located along 5 metres of a steep bank of the creek and covered in water in the creek. The largest outcrop that had been quarried was 30 x 20 metres and the smallest was 2 x 2 metres. There were very few artefacts between the quarried areas (<0.1/m^2). There were also several quartzite outcrops that showed no sign of being quarried. There was also a large outcrop north of the river approximately 300 metres down stream from the site where there were only 15 artefacts. This indicates that there had been little use of the raw material on the north side of the creek.

The quartzite used to manufacture flakes appeared to be from small rocks that can be easily removed from the soil by hand. The densities given below refer to the quarried areas only. The artefacts were made up of 70% flakes and 30% cores and only one retouched flake was detected. Approximately 20% of the cores and flakes still retained some cortical material.

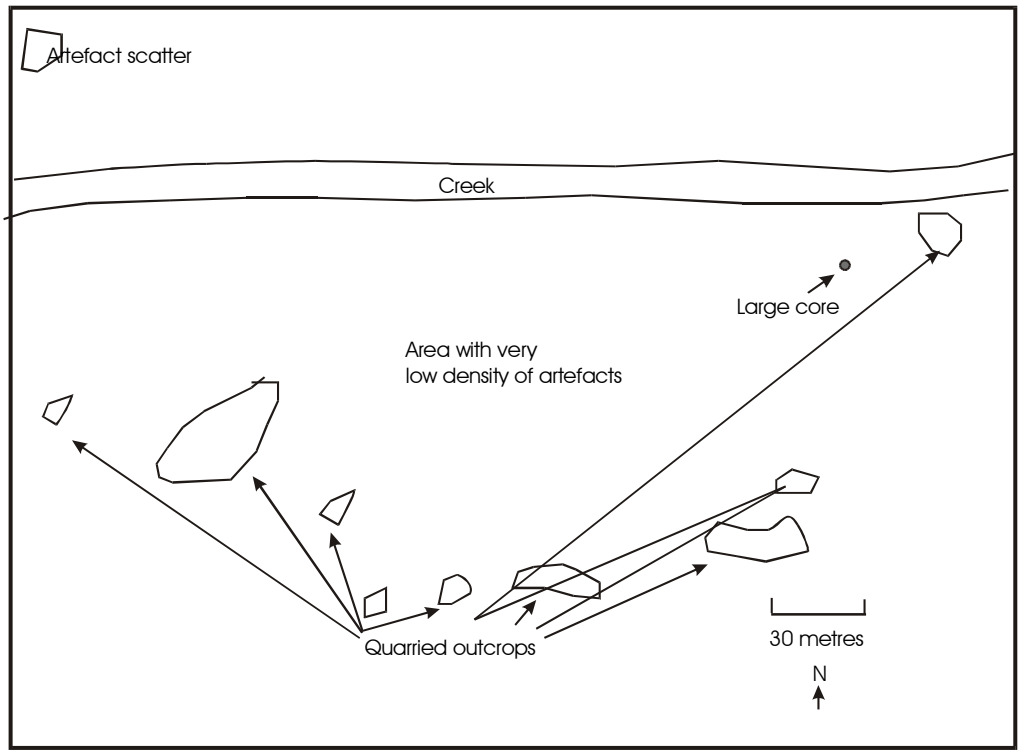
Site dimensions: 310 x 65m

Artefact densities: Maximum: 80/m^2, Minimum:5/m^2,Average:40/m^2

Artefact dimensions (length): Maximum: 80 mm, Average: 45mm

Relationship to proposed pipeline: The site is 1.9 kilometres north of the north of the proposed pipeline route revision 7 and will not be disturbed by the development.

Archaeological significance: This is the second quarry located on the western side of the Wingate Ranges. This site is considered to possess moderate to high archaeological significance as it has areas with high densities of stone artefacts that have the potential to answer questions regarding stone reduction sequences and procurement methods that reflect an intense procurement in the area. There appears to be little disturbance to the quarried outcrops and the areas between.



Site 40, facing east

Site 40, close up of a quarry area