

Public Environment Report
for the proposed
Bonaparte Gas Pipeline

***Report on Archaeology and Historic
Heritage***

A final report

**Prepared for EcOz Environmental Services for the
Australian Pipeline Trust**

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EXECUTIVE SUMMARY

The consultant was engaged by EcOz Environmental Services to identify and record any archaeological or historic sites that may be impacted upon by the construction of the proposed Bonaparte Gas Pipeline. The gas pipeline will be constructed by the Australian Pipeline Trust between the Blacktip Gas Plant at Wadeye and the existing Amadeus to Darwin Gas Pipeline south of the Ban Ban Springs homestead.

Background research was carried out to find any previously recorded archaeological and heritage sites in the area of the proposed development. The fieldwork was carried out in November and December 2006 to identify any archaeological or historic sites that may be impacted by the development. The surveys consisted of vehicle transects as near as possible to the proposed pipeline alignment and 145 pedestrian transects of various lengths, both random and purposive were made along the proposed route and over proposed construction camps and quarries. Recommendations were made in the field to realign the pipeline around the majority of identified archaeological sites and historic sites.

Eleven Aboriginal archaeological sites, thirteen historic sites and forty seven areas that contained isolated stone artefacts were located during the surveys. One stone artefact scatter and two historic sites will be destroyed by the proposed development. One stone artefact scatter and two historic sites may be disturbed during the construction phase. Forty three of the background scatters of isolated stone artefacts will be either disturbed or destroyed by the construction of the pipeline.

The recommendations for the mitigation or loss of cultural material have been made using the data from the proposed Bonaparte Gas Pipeline Route version F and are summarised below. All recommendations except for monitoring activities should be carried out before construction begins. Monitoring must be carried out, where recommended, during construction.

- **KP38 to Moyle River (KP84)**

An archaeological survey should be carried out over the proposed alignment route from KP38 to the Moyle River (Refer Section 7.0).

- **Individual sites.**

All recommendations except for monitoring activities should be carried out before construction begins.

Summary of recommendations.

Site	KP	Potential direct impact	Recommendation
BGP1	90	None	A 100 metres long temporary fence along western side of alignment
BGP2	97	None	Temporary fence 20 metres north of northern boundary of site
BGP3	104	None	A temporary fence be constructed around the site
BGP4	156	None	A 100 metres long temporary fence along western edge of alignment
BGP5	167	None	A 100 metres long temporary fence along southern edge of alignment
BGP6	176	None	A permanent fence constructed around the stone cairn. Site monitored when heavy machinery is used in the area.
BGP7	176	Destruction	Permission sought for site to be destroyed.
BGP8	16	Disturbance	A 100 metres long temporary fence along northern edge of alignment. Permission sought to disturb the site.
BGP9	16	Disturbance	A temporary fence along the northern edge of alignment

Site	KP	Potential direct impact	Recommendation
BGP10	16	None	No action required
BGP11	275	Disturbance	No action required
BGP12	268	None	No action required
BGP13	266	None	No action required
BGP14	264	None	Most northern feature to be flagged. Site monitored during construction. No action required for archaeological site.
BGP15	262	None	Most western concrete floors to be flagged. Site monitored during construction.
BGP16	257	None	No action required
BGP17	254	Destruction	No action required
BGP18	256	Destruction to majority of features	Temporary fence to be constructed around Feature 3
BGP19	253	None	Features 1-3 and 6-7 should be flagged. Site monitored during construction
BGP20	246	None	No action required
BGP21	243	None	No further action required
BGP22	242	None	No further action required
BGP23	229	None	No further action required
BGP24	227	None	No further action required

- **Isolated stone artefacts**

It is recommended that to ensure compliance with the provision of the *Northern Territory Heritage Conservation Act 1991* permission should be sought from the Minister for NRETA to disturb the background scatters of isolated stone artefacts BS1-BS25, BS30-BS44 and BS21, BS22 and BS78 recorded during TTP survey (Appendix 4).

- **Fence construction**

It is recommended that the construction of all fences for the protection of archaeological sites should be monitored by an archaeologist to ensure there is no disturbance to the sites.

- **Sub-surface cultural material**

It is recommended that a response mechanism is set up to ensure there is protection and minimal loss to any subsurface cultural material identified during the construction of the pipeline.

- **Unexploded ordnance**

Construction personnel should be informed of the possibility for the presence of unexploded bombs in the area adjacent to Fenton Airfield.

- **Operational stage**

It is recommended that the location of sites are given to any personnel working along the pipeline alignment only when works are to be carried out in the area of a site.

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1.0. INTRODUCTION

This report was prepared for Australian Pipeline Trust to describe the archaeological and historic heritage component of an environmental assessment for the proposed Bonaparte Gas Pipeline (BGP) that will be constructed between the Eni Blacktip Gas Plant near Wadeye to the existing Amadeus Basin to Darwin Gas Pipeline south of Adelaide River. Begnaze was contracted to carry out the archaeological surveys by EcOz Environmental Services.

The length of the proposed pipeline route (version Route F) is 284 kilometres. It commences at the Eni Blacktip Gas Plant on the north west coast of the Northern Territory and nine kilometres southwest of Wadeye. It ends approximately two kilometres southwest of Ban Ban Springs Station homestead. The proposed route follows the Daly River to Wadeye Road until KP34 and then rejoins the road near the Moyle River. The proposed route leaves the road again at KP138 and crosses the Daly River approximately 8 kilometres upstream of the Daly River Crossing. On the northern side of the Daly River the proposed route crosses Tipperary Station where the majority of the route is across country. There are several areas on Tipperary where the route is parallel to existing tracks and laneways. Between KP260 and KP264 the route crosses the South Dorat Road and runs parallel to Fountain Head Road and then crosses the Stuart Highway and runs across country until it meets Amadeus Basin to Darwin Gas Pipeline (refer Figure 1).

The cultural survey covered the length of the pipeline route except between KP0 and KP14 and KP38 to the Moyle River (KP84). These areas had been previously surveyed for either the Woodside Trans Territory Pipeline Project or Eni's Blacktip Project (Crassweller 2004a and b, Woolfe 2005).

The aim of the cultural survey was to define a suitable 30 metre pipeline alignment within a 100 metre wide corridor. During the survey the proposed alignment was altered to avoid any sites of significance.

This report includes descriptions of:

- A review of previously recorded archaeological and historic sites, which are located within the vicinity of the proposed pipeline route or other areas such as proposed construction camps and access roads. The review includes those sites listed on any Commonwealth and Northern Territory heritage registers.
- Archaeological and historic sites and objects located during the field survey of the entire proposed pipeline alignment (refer Figure 1).
- Assessments of significance for the archaeological site and objects located during the survey and for the previously recorded sites located near the proposed alignment.
- Impacts on sites and recommendations to either protect or mitigate the loss of any cultural values of any identified historic or archaeological places during the construction and operational phases of the project.

The map displays the Daly River region in the Northern Territory, Australia. A purple line indicates the 'Study Corridor' along the river and its tributaries. Green triangles represent 'Identified Field Survey Archaeological Sites within Project Survey Area'. A red triangle marks the 'Fenton Airstrip'. The map includes a legend, a scale bar (0 to 30 Kilometres), and an inset map of Australia showing the location of the study area. Numerous geographical features, including mountains, hills, and creeks, are labeled. The map also shows the 'Daly River (Mt Nancarrow) Conservation Area' and the 'Daly River Road'.

2.0. 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 Natural Resources Environment and the Arts (NRETA) holds the Archaeological Sites Register. 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. The historic sites listed on this register does not mean that these sites are protected or hold legal significance under the *NT Heritage Conservation Act 1991*.

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.environment.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 from the Minister of Natural Resources, 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. 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.

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 November 2006 there were three heritage or Indigenous sites recorded and six nominated for the Northern Territory. No existing or currently proposed sites will be impacted by this pipeline.

3.0. ENVIRONMENTAL SETTING

The information for the environmental background has been amalgamated from Christian and Stewart (1953), Story *et al.* (1969), Speck *et al.* (1961) Dundas *et al.* (1987), Kruse *et al.* (1990), Morgan (1972), and Stewart *et al.* (1970). The proposed pipeline route is located in the Top End region of the Northern Territory where the climate is strongly seasonal with the dry season between April and October and the wet between November and March when the majority of rain falls. There are four rivers that are perennial, the Daly and Moyle Rivers and Tom Turners and Green Ant Creeks. All other creeks have wet and / or early dry season flow.

The route mainly traverses country used for pastoral activities on either pastoral leases or on Aboriginal Land. Areas in the vicinity of the Stuart Highway adjacent to the pipeline alignment are also being mined, predominately for gold.

While the majority of the proposed alignment is located on extensive plains (Table 3.1) there are sections where the route crosses low stony hills. The two largest of these areas lies between the west of Tipperary Station to the areas adjacent to the Stuart Highway and the area south of the Daly River where the alignment also crosses steep rocky hills.

Table 3.1 describes the environment over which the pipeline traverses in more detail. The land systems have been divided into either plains, low undulating hills and uplands with steeper hills or ridges.

Table 3.1. Description of land systems along proposed pipeline route.

Land system	% of route	Description
Plains		
Angallari	20	Gently undulating coastal fluvial plain with Quaternary alluvial sandy or yellow podsolic soil, depressions are flooded for short periods during the wet, some areas of intensive patterns of braided streams. Grasslands with <i>Pandanus</i> and <i>Grevillea</i> or open woodlands of <i>Eucalyptus miniata</i> / <i>Pandanus</i> woodlands with meandering channels.
Copeman	0.3	Sub coastal plain that are either swampy with peaty clays or plains with cracking clay soils
Green Ant	1.5	Tributary plains, drainage floors, dark cracking clay. Open woodlands. The plains are mainly brownish sandy soils, mixed open forest and savannah woodlands.
Kimbyan	2	Mainly stony plains with mixed open forest and moderately extensive soils, loamy red earth with limestone outcrops
Litchfield	22	Coastal erosional plain. Mostly gently undulating granite country with occasional scattered rocky hills or rocky skeletal soils. Mostly <i>Livistona sp</i> palm and some mixed open forest.
Moyle	13	Broad, gently undulating coastal erosional plain on sandstone shale and siltstone with widely spaced drainage. Flats along stream lines are water logged all year. <i>Eucalyptus</i> open forests and <i>Livistona sp.</i> <i>Pandanus</i> and <i>Cycads.</i> <i>Melaleucas</i> near drainage systems. Low eroded strike ridges of infrequent quartzite and sandstone outcrops.
Low undulating hills		
Bend	14	Dissected foothills of erosional remnants of siltstone, sandstone, greywacke chert, dolomite and quartz with either skeletal, red or yellow earth soils. <i>Eucalyptus</i> woodland or stunted woodland. East of Stuart Highway large areas of alluvial flats
Jindara	0.7	Undulating terrain on deeply weathered and relatively unweathered sandstones, siltstone and limestone, lower slopes mainly reddish clay loam soils. Savannah woodlands.
Tagoman	9	Gently undulating terrain on sandstones, siltstones and limestone. Mid high open <i>Eucalyptus</i> woodlands
Tipperary	5	Mixed low hills and undulating plains on sandstone, limestone and some shale. Mostly low open forest or mixed open forest

Land system	% of route	Description
Dissected uplands		
Baker	1.5	Dissected uplands and isolated strike ridges of greywacke sandstone and siltstone. Skeletal soils and outcrops, sandy red and yellow soils <i>Eucalyptus</i> woodland
Brocks Creek	2	Small areas of rugged parallel ridges of sandstone, siltstone, granite, metamorphic rock and greywacke. Small patches of undulating country. Rock outcrops, skeletal soils with <i>Eucalyptus</i> woodland
Buldiva	3	Erosional rocky hills of quartz sandstone outcrops and skeletal Mid high open <i>Eucalyptus</i> woodland
Pinkerton	6	Rugged stony country on sedimentary rocks, open woodlands of <i>Eucalyptus tetradonta</i> and <i>E. miniata</i> . In survey area it consists of rises and erosional hills slopes to 20% rock outcrops and lithosols on sandstone, siltstone.

The plains south of the Daly River on the Cambridge Gulf Lowlands are covered by deep deposits of Quaternary alluvium with broad shallow depressions and widely spaced streamlines (Moyle and Angallari L.S.). The gently undulating plains overlie sandstone and siltstone. The proposed pipeline alignment also lies adjacent to a few low hills and crosses the base of a residual, steep sided hill, Mt Goodwin (locally known as Air Force Hill). These slopes have stony or gravelly soils. There are also erosional plains of the Litchfield land system that lie over granites with occasional scattered rocky hills and low outcrops.

Small sections of the proposed pipeline cross the sandstone, siltstone and dolomite of the Pinkerton L.S of the Victoria River Basin. These areas are located along the base of the rugged escarpment north of the Moyle River and south of the Daly River. Between the escarpment and the plains south of the river the pipeline crosses a small area of the Elevated Back Bone geomorphological unit (Buldiva and Brocks Creek L.S.) that consists of the Buldiva Quartzite and the Finnis River geomorphic groups made up of shale, siltstone, sandstone, greywacke, conglomerates, schist and gneiss. There are floodplains around Chilling Creek (Copeman LS) that runs between steep rocky hills southwest of the Daly River.

The country between the Daly River and the end of the proposed pipeline alignment is on either the Daly River Basin or the Elevated Backbone Country. The plains on Tipperary Station have a gentle topography with generally deep permeable soils of either carbonated or granite plains, surface and alluvial soils, sandy silty soils and gravel with occasional low limestone outcrops (Tipperary, Green Ant, Kimbyan and Tagoman L.S.). The Daly Basin lies on the Daly River geological group of limestones, siltstone, sandstone and conglomerate. A small section of the alignment in the west of Tipperary Station crosses the Elevated Backbone Country of stony low hills of Buldiva Quartzite geomorphic group.

From Tipperary Station to the Ban Ban Springs the Elevated Backbone Country borders the Daly River Basin and consists of eroding upland country described as undulating terrain with scattered hills, isolated strike ridges and alluvial flats. The hill slopes and summits are the erosional remnants of siltstone, sandstone and quartz on slightly weathered meta-sediments of the Burrell Creek geological formation (Jindara, Bend and Baker L.S.). Colluvial wash slopes have a veneer of siltstone flakes and / or sub-angular stony quartz in a loamy mix. Soils are either gravelly or skeletal on the slopes and summits or silty, sand or clay soils on the flats.

Within ten kilometres of the survey areas there is Gerowie Tuff with cherty tuff and the Mt Bonnie Formation containing siltstones with rare chert nodules (Needham and Stuart-Smith 1984). These geological units contain suitable raw material used in the manufacture of stone artefacts.

3.1. Environmental factors affecting the archaeological visibility.

The archaeological visibility will be relatively low on the alluvial plains areas of the pipeline alignment route. Any stone artefacts discarded in the past in this area would be quickly covered by

sediments when the areas are flooded. Any sites on the banks of creeks and rivers will be disturbed and the artefacts moved by the flood waters over the banks. There will be a higher potential for locating artefacts on the plains areas where there are gravelly surfaces on the low hills and ridges where erosion may be occurring.

While the undulating hills area consists generally of erosional surfaces where there is a good prospect for locating stone artefacts, the potential for the presence of sites in this area is relatively low as there is very little diversity in the vegetation and very few features to attract Aboriginal people to the area. The type of environment that could act as a focal point for past settlement patterns is where there is either a source of water or a raw material suitable for the manufacture of stone artefacts.

The dissected uplands contain a variety of raw materials used for manufacturing stone artefacts and there is more ecological diversity in this environment of erosional hill slopes and small alluvial valleys. Therefore this area has a higher prospect for locating archaeological material.

4.0. 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, (NRETA).
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 (NRETA).

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 (NRETA) and the Northern Territory Museum.

4.2. Historic background

The area around the Stuart Highway in the vicinity of the proposed pipeline alignment was one of the first places in the Territory to be impacted by non-Aboriginal activities while the Daly River region was largely undisturbed and relatively isolated until recently.

European explorers were the first Europeans to visit the region in the 1860s, followed by the crews who constructed the Overland Telegraph Line from Darwin to Port Augusta between 1870-1874. After gold was discovered in the Pine Creek region during the construction of the Overland Telegraph Line extensive mining activities have occurred in the region ever since. Gold was first discovered in 1870 south of Ban Ban Springs homestead in the area of Yam Creek. This sparked a minor gold rush and by 1873 there were as many as eleven mining companies in the area (Mitchell 1994). These companies assumed that the discovery of surface gold indicated the presence of gold at depth (Jones 1987). However due to the lower than expected yields, the cost of developing mines in the area these European ventures were abandoned. However Chinese miners came in large numbers and at one stage the Fountain Head lease had over 1000 Chinese alluvial miners working around Fountain Head and there was a sizeable township. However by 1880 only 50 remained. In 1884 many Chinese returned to the field and Fountain Head was once again a sizeable township where the dwellings were made of bamboo and grass and the miners were on reefs with shafts fifteen to twenty feet deep (Jones 1987:53). Jones (1987:52) noted 100 years later that for one square mile around Fountain Head the surface had been turned over by alluvial diggings and at the southern end by several open cuts and deep shafts.

Further exploration was carried out in the region to find suitable pastoral lands. In 1879 Glencoe Station was the first pastoral lease to be stocked by graziers Travers and Gibson. By 1885 the homestead was substantial and run by Fischer and Lyons who were selling their stock to the gold fields. The original homestead was abandoned and removed in 1910. When Vestey's bought the property in 1920 they used the station as a depot for transporting cattle by rail to Darwin via the Fountain Head trucking yard.

In 1883 Fisher and Lyons also started the Daly River Station, which includes what is now Tipperary Station. However floods, disease and sporadic raids by Aboriginal people led to the abandonment of the station in 1889 (Forrest 1994). Thorley (2002) suggests that due to the large size of the cattle runs the workers spent large periods in stock camps and isolated areas. Consequently wooden yards for holding cattle often near a source of water and rough bush camps were developed to service the outlying areas. The station was abandoned until 1916 when the Byrne family started Tipperary Station and moved the homestead to its present site (Forrest 1994). The

original homestead has been damaged by agricultural activities and by the construction of a gravel road.

The North Australian Railway was constructed during 1885-88 between Darwin and Pine Creek to serve the goldfields and to eventually join up with the southern railway systems. However mining was in decline as much of the gold rush had finished by the time the line was completed. The railway played an integral part during World War II when the railway carried supplies and personnel. The line was closed in 1976.

During World War II numerous military airstrips and camps were constructed along the Stuart Highway and included No. 86 Station Hospital on Fountain Head Road that served the USAAF bomber squadrons using Fenton and Long airfields. In 1943 with the arrival of the RAAF at the airfield, the hospital was taken over by the Australian No. 27 and 30 Medical Clearing Stations (Pearce and Alford 2006). The main section of this site now consists of a scatter of concrete slabs on the side of a prominent hill (Conservation Commission n.d., Conservation Commission 1996).

The 404th Quartermaster Platoon Stores established in 1943 to support USAAF operations was situated on a rise overlooking the southeast junction of Fountain Head Rd and the Old North-South Road located west of the present Stuart Highway (Dermoudy 1989, Alford 1996). There were four Sydney Williams huts which were used as warehouses, a domestic camp and an administrative area. The huts were sold off after the war and only the concrete floors remain.

The Fenton Airfield was developed as the main heavy bomber base for the North Western Area of Operations in 1942 and long range reconnaissance and strike missions were made by B-24 Liberator Bombers to Timor, Sulawesi and the Maluku Islands (Pearce and Alford 2006, Alford 1996). A cleared crash landing strip and an aircraft graveyard were established in 1943. The field was bombed several times and there are the remains of several crashed aircraft in the area. The Fenton camp was located north of the airfield and consisted of a squadron camp on the flat ground south of an area known as 'headquarters hill', which contained commanding officers' headquarters, administration, an open air theatre, recreational areas, officer clubs and messes. The area was abandoned apart from caretaker units in late 1945 and the majority of the remains consist of concrete floors. There are also numerous aircraft crash sites in the Tipperary and Ban Ban Springs region (Alford 2001)

Brocks Creek historic township, which is located approximately 2 kilometres west of the proposed pipeline alignment area, was a large army camp that consisted of a detention centre, a Bulk Issue Petrol and Oil Depot (BIPOD) and a field supply depot. In 1944 a pipeline was constructed from Brocks Creek to the Fenton and Long airstrips to transport fuel (Conservation Commission n.d.). Some of the material remaining around the historic gold mines was re-used during this period. For example a 16,000-gallon tank was reduced and then reassembled as a swimming tank for soldiers in Adelaide River (Rayner 2001).

The majority of land south of the Daly River is located on Aboriginal lands that have had only sporadic or minor European intrusions, as access to non-Aboriginals has been restricted. The area was made an Aboriginal Reserve in 1885 with the area increasing in 1948 and again in 1963. In 1976 the ownership was handed over under the *Aboriginal Land Rights Act* (Stanley 1985).

In 1886 the Jesuits missionaries set up a mission on the western side of the Daly River near the present day location of the Mango Farm and another mission was built in 1891 on Serpentine Billabong and closed in 1899. A police station was built in 1915 near Horseshoe Billabong and relocated in 1935 to the present location near the crossing. Copper was discovered in the Hayward Range in 1880 near the location of the present day historic site of the Coppermine located north of Wooliana Road. The area was mined sporadically from 1884 for 26 years. The attack on the Coppermine in 1884 by Aboriginals resulted in the deaths of four of the miners at the mine. The

attack was blamed on the Daly River people and resulted in severe reprisals and massacres with an estimated 150 Aboriginal people shot dead.

Some of the earliest non-Aboriginal occupants of the area were Chinese who started a market garden on the Peron Islands at the mouth of the Daly. As with all agricultural ventures in the early days of the area the market garden was short lived as there were difficulties with the climate, the soils and marketing (Powell 1966:95). Other small scale farming along the Daly River included sugar growing in the 1880s, a government experimental farm that tried pig farming and peanut growing. These ventures were often carried out by settlers who were given free blocks from 1911 onwards (Pye n.d., Forrest 1994).

Aboriginal people were displaced from the Daly region by European settlement and they either moved into other areas south of the Daly River or onto the European settlements (Stanner, 1979, 1933a, 1933b and Gleeson and Richards 1985). Their numbers were decreased by an epidemic of influenza and whooping cough in 1888 (Forrest 1994) and their traditional way of life was weakened by their dependence on European or Chinese goods especially opium, alcohol and tobacco.

Permanent European occupation of the Port Keats (Wadeye) region did not begin until 1935 with the establishment of a Catholic Mission on the coast at Port Keats (Pye n.d.). Cattle were brought in to the Port Keats area from Tipperary Station in 1938. In 1939 an airstrip was constructed at the mission and the first vehicle to arrive was not until 1950 when the drivers followed the foot track used by Aborigines to reach the Daly River region approximately 150 kilometres to the north.

In the Port Keats region the 39 Radar Station was constructed on the top of Mount Goodwin, now known as Air Force Hill. (Fenton 1996). The station was part of a radar chain across the western approaches to the Darwin area. The camp was situated on the lower southern slopes of the hill on either side of the track to Port Keats (Wadeye). The structures included a power house, cook house, latrines, showers, mess hut and accommodation for the staff that consisted of tents with floors made of packed termite mound material then covered in malthoid. The station and camp were dismantled in 1945.

4.3. The distribution of historic sites.

The potential for unidentified historic sites within or adjacent to the pipeline alignment will be greater in the eastern section of the alignment where the area has been extensively mined since 1870 and where there are numerous World War II camps and facilities. While the larger historic sites in the region have been recorded and mapped there is a high potential for the presence of unrecorded smaller sites in the area. The remainder of the pipeline alignment crosses either pastoral or Aboriginal lands where the presence of Europeans was either infrequent or non-existent. Consequently any historic remains will be associated with the pastoral industry and consist of cattle yards or old campsites.

The most common historic objects associated with the 19th century mining sites in the area are broken bottle glass, porcelain, metal fragments and implements and to a lesser extent earthenware (Mitchell 1995). These objects are associated with mine workings, pits, adits and shafts. Structural features are less common although all goldfields had at least one stamp battery.

The World War II camps generally consist of concrete slab floors, and rubbish dumps of broken beer bottles, tin food containers and 44-gallon drums. In the area of airstrips there are the remains of light artillery anti-aircraft gun emplacements that were used to protect the airstrips. Generally there are not as many isolated objects scattered around the camps as are found in the gold mining settlements as the majority of the camps were dismantled and cleared after the end of the war.

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 investigating Aboriginal subsistence strategies and material culture was carried out by Basedow (1907), Foelsche (1882), Thomson (1983) and Spencer (1914). 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. Seasonal factors were a key determinant on camp locations, types of residential grouping, the degree of mobility and the nature of subsistence activities. During the wet season groups of people would have been able to access resources over a wider area, as water was readily available and higher uplands used to avoid the rivers and tributaries. In the dry season as water receded the location of camps would have contracted to more permanent sources of water.

There is very little detailed ethnographic data available for the northern section of the pipeline alignment, however Dahl (1927) spent some time located at Mt Shoebridge approximately 15 kilometres west of the pipeline between 1895-95. He noted the effects of tobacco, spirits and disease on those Aboriginals in close proximity to Chinese mining sites (Dahl 1927:17). He also found a similar use of resources and settlement patterns as mentioned above. Dahl noticed that the rock shelters round Mt Shoebridge had been utilised during the rainy season and he also observed a small deserted camp of bark shelters at the base of a valley which was apparently occupied in the previous wet season (Dahl 1927:173).

In the Daly River region ethnographic research was carried out by Stanner (1933a, 1933b 1979) and Falkenberg (1962). By the time they had carried out their work the Daly River people had undergone significant disruptions through European contact. However traditional items were still being traded in the 1930s. Stanner (1934) documented the elaborate system of exchange called Merbok when items such as ochre, spears, hair belts, human hair for twine, dilly bags, boomerangs, pearl shell, wax and European goods were exchanged between groups of people.

4.5.1. Prehistoric archaeology

The majority of the archaeological and historic research in the region around the proposed pipeline alignment has been carried out in areas where there has been a legislative requirement for heritage approval before any development can commence. There has been a lack of archaeological research carried out in areas where there has been little development or where there is an absence of European involvement on Aboriginal lands. Consequently the areas around the gold fields and adjacent to the Stuart Highway have been relatively intensely surveyed. For example on the Archaeological Site Register held by the Heritage Conservation Services there are 94 Aboriginal archaeological sites recorded on the Pine Creek 1:100,000 map sheet register, whereas there are only seven archaeological sites on the register for the area between Tipperary Homestead and Port Keats.

Earliest recorded archaeological research around the Port Keats was carried out by Stanner who excavated the Yarar rockshelter and collected artefacts from Nyik, a nearby open site (Gregory 1998). This early research tended to examine individual sites rather than explore how the archaeological record can be used to interpret past Aboriginal regional subsistence strategies and site distribution. This method of research has only been documented over the last fifteen years.

Yarar and Nyik are located approximately 20 kilometres south of the pipeline alignment. 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. Another rock shelter, Papangarla located on the edge of the escarpment south of Palumpa contains art of mainly 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 were 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 percentage of sites located less than 500 metres from permanent water.

Recent archaeological surveys carried out in the Wadeye region have identified only one small open stone artefact scatter on the edge of a stony ridge that rises 10 metres above the undulating plain (Crassweller 2006a). The stone assemblage contained one raw material, a white quartzite, similar in appearance to the quarries on the Wingate Mountains (Crassweller 2004). Only four areas of isolated stone artefacts were identified between the Blacktip Gas Plant and the Wingate Mountains during the Trans Territory Pipeline survey (Crassweller 2004). These artefacts were located either adjacent to creeks or on the top of a rocky ridge or hill and were grindstones or unretouched flakes.

Aboriginal archaeological sites identified during previous archaeological surveys between Adelaide River and Pine Creek (Austral Archaeology 1993, Guse and Gregory 1994, Guse 1995, 1996 and 1998, Baker 1983, Heritage Surveys 1995a and b, Crassweller 2006c, 2006d, 2005, Mulvaney 1990, Megirian 1986) have found that the most common form of archaeological sites are medium to small sized artefact scatters and quarries located mainly on low rises and ridges.

The dominant raw materials used to manufacture the stone artefacts at these sites were quartz or Gerowie tuff with smaller proportions of chert and hornfels. Quartz and tuff stone quarries were located around outcrops where the quality of the raw material was suitable for artefact manufacture.

In the Daly Basin area there have been two archaeological investigations, one 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.

The majority of the artefact scatters located during Thorley's (2002) and Guse's (2001) surveys were on highly eroded, older levee banks or gullies and on plains in heavily eroded areas.

In low lying areas, behind levees, or minor drainage floors within younger levees, stone artefacts were only located after there had been at least 20cm of erosion. Thorley (2002) suggested that flat to undulating terrain away from watercourses will have very little archaeological potential. This suggests that the visibility of archaeological material is highly dependent on the exposure of subsurface material through erosion. The majority of stone artefacts were manufactured from chert with smaller proportions of quartzite, quartz, greywacke, silicified siltstone and hornfels. All the quarries in this region were extracting chert.

An archaeological survey carried out by Crassweller (2002) along the Daly River and approximately 20 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 there may be a continuous scatter of artefacts along the margins of the river.

4.5.2. The distribution of archaeological material.

The above discussions of the environmental, ethnographic and archaeological background suggest 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.

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 on the edge of the escarpment were most frequently located close to water. However south of the Daly River there are large areas of the pipeline route that consists of sandy and alluvial plains and it is unlikely that artefacts will remain long on the surface, even along eroding creek banks where they would be quickly covered or moved after the annual wet season floods

North of the Daly River on Tipperary station it is predicted that archaeological material will 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 watercourses.

There is a low potential for locating intact archaeological sites along the pipeline alignment from the Dissected Uplands on Tipperary Station to the end of the alignment as much of this area has been disturbed by past mining activities or World War II infrastructures. In undisturbed areas there is a higher potential for identifying artefact scatters or quarries on the eroded hills and ridges.

5.0. METHODOLOGY

5.1. Survey procedures

The archaeological survey of the pipeline section consisted of both vehicular and pedestrian transects. The presence of the surveyor who was using a differential GPS to record the proposed route ensured that the areas surveyed were within the 30 metre wide corridor. The vehicular transects were made as close as possible, usually within 20 metres of the centreline of the total length of pipeline alignment, except between KP38 and the Moyle River which had been surveyed during the Trans Territory Pipeline. The vehicle was travelling between 5-10 kilometres per hour. Further vehicle transects were made along all the proposed access tracks.

Pedestrian transects, either purposive or random, were made at intervals along the proposed pipeline alignment and access tracks. Pedestrian transects were also made over all proposed construction camps, quarries, the scraper facility, and areas that will be disturbed by the construction of either cathodic protection areas, the HDDs, and pipe strings associated with HDDs. Purposive pedestrian transects were made over areas where there appeared to be a potential for the presence of archaeological material. These areas consisted of all creek and river crossings, edges of flood plains and higher ground made up of either gravel rises, rock outcrops, hills and ridges. Random transects were made between the purposive transects to ensure that there was no bias in the selection of types of terrain surveyed.

The survey was carried out in November-December 2006 by Christine Crassweller and Silvano Jung who usually walked 10 to 40 metres apart along the proposed alignment. The pedestrian transects made over the areas proposed as construction camps or quarries consisted of parallel transects no more than 30 metres apart.

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 hand-held Global Positioning System (GDA94). 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*.

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. These details are listed in Appendix 2 and have been used to estimate the density of sites and background scatters within different environments.

5.2. Types of archaeological sites.

There are eight types of sites previously recorded in the region through which the proposed pipeline alignment traverses and 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 have been repeated occupations.
- *Stone quarries* are generally sites where stone for flaked or edge ground artefacts have been extracted from an outcropping source of rock (Hiscock and Mitchell 1993).
- *Knapping floors* are discrete scatters of artefacts consisting of the remains of a single reduction event associated with the fabrication of implements.
- *Stone arrangements.* These can 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.
- *Scarred trees* may have formed by the extraction of honey (sugar bag), removal of bark for containers, wood for spear throwers or shields.
- *Burial sites and skeletal remains* are often found in rock shelters. In more recent times there has been the adoption of Christian style of graves. They are commonly marked with heaped stone, sheets of metal or situated under prominent trees.

5.3. 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 ten artefacts that cover an area of at least 2m². 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 will be given location details for research purposes.

5.4. Artefact identification

A requirement for a successful archaeological project involves the accurate identification of archaeological materials. For a stone piece to be identified as artefactual 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 erailure scar in an appropriate position below the platform.
- definite remnants of flake scars on the dorsal surface or dorsal ridges.

Stone artefacts are divided into 4 main types (Hiscock 1984:128-129). They are defined as follows:

- *Cores* are pieces of stone that have one or more negative scars and the absence of positive flake 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 e-raillure 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 pieces* 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 region are listed below. They are based on characteristics outlined by McCarthy (1976) and Holdaway and Stern (2004).

- *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* display use wear on the surface in the form of abrasion, pitting, 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.

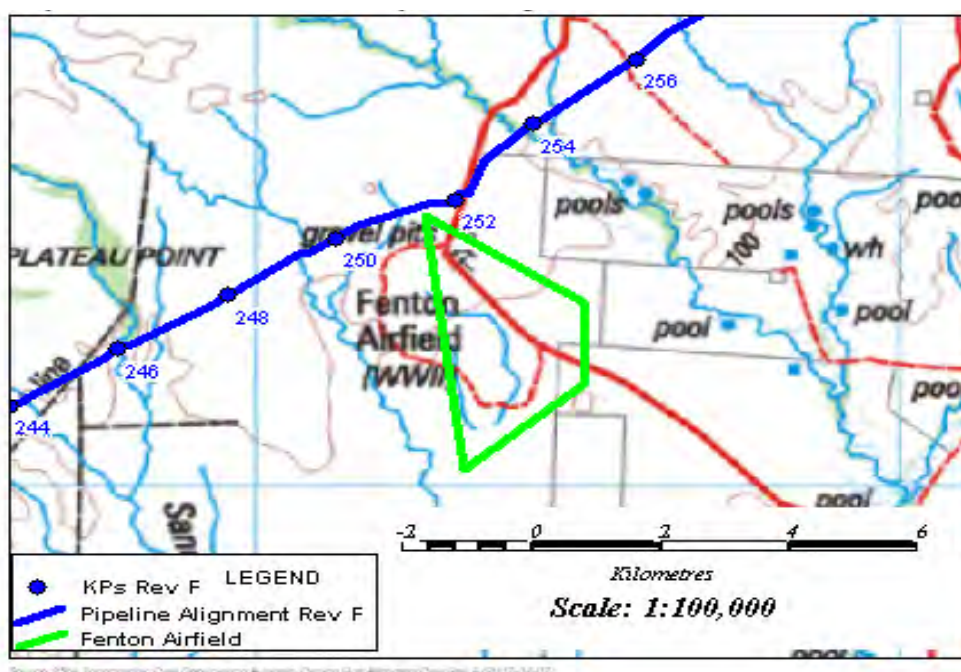
6.0. RESULTS

The first part of the results section summarises previously recorded sites located within the original 30-kilometre wide study corridor. They are all listed in Appendix 1. This is followed by a summary of the archaeological and historic material located during the survey. A more detailed description of these sites is in Appendix 3 and the background scatters of isolated stone artefact in Appendix 4.

6.1. Sites recorded under Commonwealth legislation.

There are eleven historic sites located within the study corridor that are on the Register of the National Estate. Only one site, Fenton Airfield is located adjacent to the proposed 30 metre wide Bonaparte Gas Pipeline alignment. There are no direct legal constraints that can be implemented for the protection of this site under Commonwealth legislation. The area that defines the Fenton Airfield is shown below. The proposed alignment is approximately 200 metres north of the northeast corner of the defined area.

Figure 2. Map of Fenton Airstrip and proposed alignment



6.2. Sites recorded under Northern Territory legislation

There are seven historic sites listed on the Northern Territory Heritage Register that are located within the original 30-kilometre study corridor. Only one of these protected sites, Fenton Airfield may be disturbed by a proposed access track leading to the 30 metre wide pipeline alignment (see details in Section 6.5.). The exact boundaries of the Fenton Airfield protected area under Northern Territory legislation are not clearly defined.

There are 48 archaeological and seven historic sites listed on the Northern Territory Archaeological Sites Register that are located within the 30-kilometre study corridor. There are no archaeological or historic sites listed on the Archaeological Site Register that are located near the proposed 30 metre wide pipeline alignment.

6.3. Other recorded archaeological or historic sites.

Thirty three additional historic sites have been identified through other sources that are located within the 30-kilometre corridor. The majority are located in the north-eastern section of the corridor and are associated with pastoral, mining or World War II activities. The proposed alignment crosses an area northwest of the Fountain Head Mine site that was possibly in the area mined in the 1880s by Chinese alluvial miners.

Two historic sites, No. 86 Station Hospital and 404th Quartermaster Platoon Stores are located adjacent to the 30 metre wide alignment. The alignment also passes within 40 metres of sections of the Fenton Camp and Group Headquarters.

As all these sites are not listed on any register held by Heritage Conservation Services they are not protected under any Northern Territory legislation. The Fenton Camp is north of the Fenton Airfield protected area.

There are eight recorded Aboriginal archaeological sites located within the study corridor that are not listed on any registers. None of these sites are located on or adjacent to the proposed 30 metre wide pipeline alignment.

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

A total of 145 pedestrian transects were completed, 129 of which were made along the proposed pipeline alignment. This averages out at one transect, approximately 930 metres in length every 2.2 kilometres of the proposed alignment. As approximately 80% of the 30 metre wide alignment had been burnt in the dry season, surface visibility was generally high with only 30% of the pedestrian transect having a surface visibility of 60% or less. The surface of most of the alignment was undisturbed, however there were large areas on Tipperary Station that had been cleared of vegetation. Some areas along the pipeline alignment west of Tipperary Homestead had been recently cleared. There were also large tracts of land east of Green Ant Creek that were covered in re-growth, which one of the traditional owners stated had been cleared in the 1970s and 1980s.

The recent construction of an optic fibre cable from Daly River to Wadeye built adjacent to the road has resulted in a high surface disturbance over the creek and river crossings in the vicinity of the proposed pipeline route crossings. For example there was a background scatter of isolated stone artefacts on both sides of the Moyle River optic fibre cable crossing. It is possible that the archaeological material located during the survey may be the remains of a disturbed site.

The archaeological survey was carried out over eighteen days and identified eleven Aboriginal archaeological sites, thirteen historic sites and forty seven areas that contained isolated stone artefacts. One of the sites, Site 14 contained both historic and Aboriginal material. More discussion on these is provided in sections 6.4.1 and 6.4.2 below.

Table 6.1. Summary of all sites located during the survey.

Site No.	Easting	Northing	Land System	Site Type
BGP1	616610	8428366	Angallari	Scarred tree
BGP2	621260	8433064	Angallari	Stone artefact scatter
BGP3	628068	8434144	Litchfield	Stone artefact scatter
BGP4	668852	8463122	Litchfield	Stone artefact scatter / knapping floors / grinding hollows
BGP5	677390	8468950	Litchfield	Stone artefact scatter
BGP6	685830	8468566	Pinkerton	Stone arrangement
BGP7	685861	8468563	Pinkerton	Stone artefact scatter
BGP8	560609	8423852	Moyle	Stone artefact scatter

Site No.	Easting	Northing	Land System	Site Type
BGP9	560747	8423856	Moyle	WWII dump
BGP10	562093	8422758	Moyle	WWII dump
BGP11	770266	8510922	Bend	Mine diggings
BGP12	762641	8504866	Bend	WWII dump
BGP13	761403	8504294	Bend	Stone quarry / knapping floors
BGP14	760750	8503982	Baker	WWII, No. 86 Station Hospital , quarry & stone artefact scatter,
BGP15	759212	8501500	Baker	WWII, 404 th Quartermaster Platoon Stores
BGP16	755952	8498002	Bend	WWII dump
BGP17	754250	8496656	Bend	WWII dump
BGP18	755447	8498402	Bend	Fenton WWII dump
	755431	8498438		Fenton WWII dump
	755423	8498524		Fenton WWII dump
	755606	8498160		Fenton WWII dump
	755480	8498420		Fenton WWII dump
	755514	8498370		Fenton WWII dump
	755476	8498338		Fenton WWII dump
	755363	8498590		Fenton WWII dump
BGP19	753485	8496018	Bend	Fenton Camp, Feature 1 - concrete floors
	753467	8495938		Fenton Camp, Feature 2 - concrete floor
	753124	8495422		Fenton Camp, Feature 3 - concrete floor
	752376	8495114		Fenton camp, Feature 4 - WWII dump
	751254	8494434		Fenton Camp, Feature 5 - gun emplacements
	751219	8494544		Fenton Camp, Feature 6 - 4 gallon drum chuffers
	751034	8494386		Fenton Camp, Feature 7 - 44 gallon drum target
BGP20	747625	8492382	Bend	Stone quarry
BGP21	744080	8490864	Bend	European stone cairns
BGP22	743548	8490716	Bend	Mining drill site
BGP23	737348	8486436	Kimbyan	Cattle yard
BGP24	732147	8481760	Tagoman	Base of water tank

6.4.1. Archaeological sites.

Overall there were few archaeological sites located during the survey in the vicinity of the pipeline. The density of archaeological sites identified along the pipeline alignment is one site every 25 kilometres. The survey covered only a 100 metre wide corridor, which was pre-selected to avoid as many creeks and ridges as possible. Consequently the route avoids locations more likely to contain archaeological material. Eight of the sites (BPG1-8) were located south of the Daly River or one site every 21 kilometres while only three sites BGP13, 14 and 20 were identified north-east of the river, or one every 38 kilometres.

The difference in the density of sites may be the result of the loss of sites in the north-eastern section either through land clearance or developments. However it is more likely that the scarcity of sites is related to the environments over which the pipeline traverses. Between the Daly River and Wadeye there are several perennial rivers and creeks that would supply a reliable source of fresh water and there are large alluvial plains, which would have been used for food and other resources. Some sections of the alignment are adjacent to higher ground where there is a source of raw material used in the manufacture of stone artefacts. North-east of the Daly River there are large tracts of land on Tipperary Station consisting of featureless undulating plains, covered in similar vegetation and with only Green Ant Creek present as a reliable source of water.

The sites consisted of seven stone artefact scatters, three stone quarries with knapping floors, a stone arrangement and a scarred tree (Table 6.2.). One of the stone artefacts scatters also

contained grinding hollows and several knapping floors. The sites were generally small and the average density of the stone artefact assemblages at all sites except BGP20 and BGP14 was low, ranging from 0.1 to 0.25 artefacts per square metre. Site BGP20, a small quartz quarry had an average artefact density of 8.75 artefacts per square metre. BGP14 consisted a tuff quarry and a separate stone artefact quarry located in an area that had been highly disturbed by a World War II site. Table 6.2. shows that the majority of archaeological sites are adjacent to a source of water and the remainder on the ridges and hills.

Table 6.2. Summary of stone artefact scatters, stone arrangement and scarred tree

Site	Type	Dimensions (m)	Average artefact density	Dominant raw material	Environment
BGP1	Scarred tree				Ephemeral creek
BGP2	Stone artefact scatter	26 x 12	0.4	Quartzite	Perennial creek
BGP3	Stone artefact scatter	5 x 5	0.8	Quartzite	Ephemeral creek
BGP4	Stone artefact scatter, knapping floors , grinding hollows	6 x 14	20 & 0.5	Quartz	Ephemeral creek
BGP5	Stone artefact scatter	8 x 4	0.1	Quartz	Ephemeral creek
BGP6	Stone arrangement				Hill top, Daly river
BGP7	Stone artefact scatter	8 x 15	0.18	Chert	Hill top, Daly river
BGP8	Stone artefact scatter	5 x 8	0.25	Quartzite	Lower slopes of steep high hill
BGP13	Stone quarry	20 x 30	0.2	Tuff	Stony ridge, creek
BGP14	Stone artefact scatter and quarry	3 x 3, 5 x 5	0.4, 1.5	Tuff	Hill top
BGP20	Stone quarry	4 x 2	8.75	Quartz	Stony hill slope, ephemeral creek

The scarred tree BGP1 is located near the banks of an ephemeral creek where two silcrete flakes were also located (Background Scatter 2). The stone arrangement BGP6 is located on the summit of a small saddle between two steep stony hills that overlooks the Daly River to the north-east and Chilling Creek to the south. This site is probably an 'increase site 'where the Aboriginal people would place stones of various sizes in particular places (Elkin 1932:478-479) in order to increase the availability of a specific resource. A small, low density artefact scatter BGP7 was also identified on top of the ridge.

6.4.2. Background scatters

Forty seven areas containing isolated stone artefacts were identified during the survey (see Appendix 4 of this report). Four of the background scatters, BS26-29 are not located on the final pipeline alignment east of Wadeye, but were identified during this survey. Three of the background scatters were located in the vicinity of the pipeline alignment during the TTP survey.

The majority of the background scatters contained three or fewer stone artefacts. The largest background scatter consisted of nine artefacts located along 50 metres of an ephemeral creek. The frequency of background scatters along the proposed alignment averages out at one every 6 kilometres and there is little difference between the frequency of background scatters north-east and south-west of the Daly River, one artefact every 6.2 and 5.9 kilometres respectively. However the number of artefacts in the background scatters is higher at 69 artefacts south-west of the Daly River and 43 artefacts north-east of the Daly.

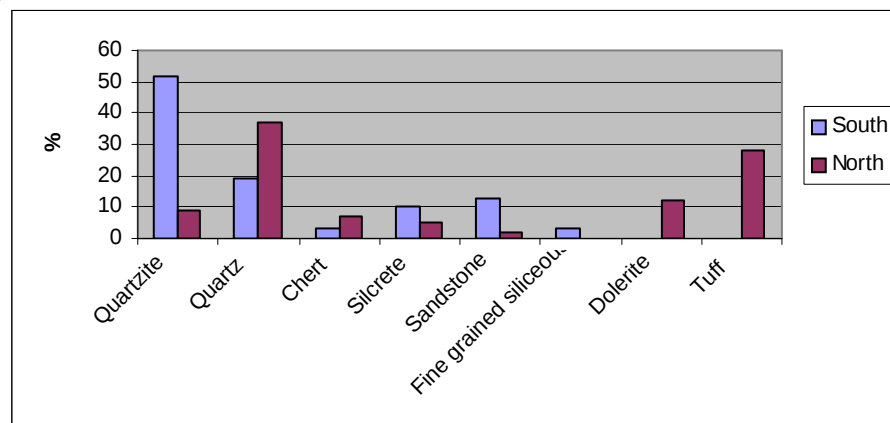
Unretouched flakes were the most common artefact type, followed by retouched flakes, (21% and 25%, south-west and north-east of the Daly river respectively) and cores (9% and 4%) respectively. The retouched flakes included two quartzite bifacial points and one tuff unifacial point. Five grinding stones (mullers) were located south of the river, none were identified north-

east of the river. There were two grindstone slabs in the north-east and one in the south-west of the pipeline alignment.

One unique isolated artefact, BS18 which was identified by a traditional owner was a sandstone rock that had been used to scrape *Livistona* palm fronds. The long edge of the rock had small negative scars along the edge.

There are also differences in the proportion of the different raw material of the artefacts on either side of the Daly River. Figure 3 shows that over 50% of the artefacts south of the Daly River are made from quartzite, while quartz and Gerowie Tuff are the dominant raw materials used north-east of the river.

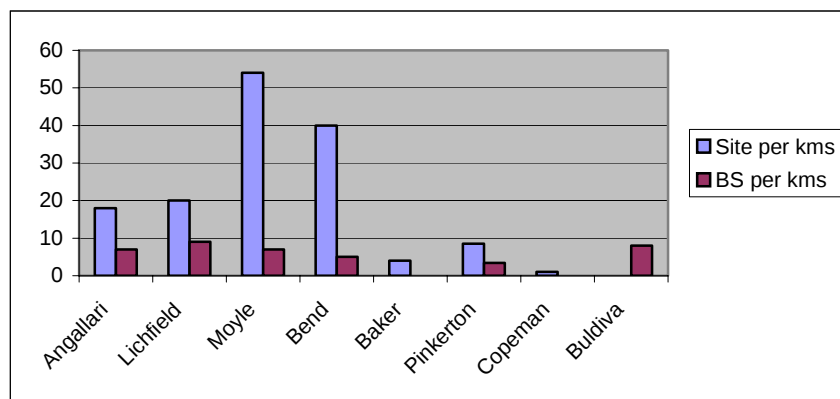
Figure 3. Proportions of the raw material of isolated artefacts, north-east and south-west of the Daly River



6.4.3. Discussion

The findings from this survey are similar to those identified during previous archaeological research in the area over which the pipeline traverses. There is a low density of archaeological sites on alluvial plains and undulating terrain and the majority of sites and isolated stone artefacts were located near a source of fresh water. The relationship between the location of sites and the land system on which they lie is shown in Figure 4. There is a higher frequency of archaeological sites on the uplands section of the pipeline alignment in the Pinkerton and Baker Land Systems (one site every 4 and 8.5 kilometres respectively) whereas there is a lower frequency of sites on the plains area of the route on the Moyle and Bend Land Systems (one site every 54 and 36 kilometres respectively). However there is less difference in the frequency of background scatters between each land system. This difference may be the result of the varying archaeological visibility between eroding higher surfaces and the depositional plains. The sites along the creeks on the plains may have been disturbed by floodwaters and the only remaining artefacts are present as isolated artefacts. The relatively even frequency of the isolated artefacts also indicates that all environments were accessed in the past.

Figure 4. Frequency of archaeological material in the different land systems



6.4.4. Historic sites

The pipeline is adjacent to five previously recorded archaeological sites, Fountain Head Mine, an historic mining site and four World War II sites, No. 86 Station Hospital, 404th Quartermaster Platoon Stores and Fenton Airfield and Camp. As the pipeline alignment was adjacent to only small areas of these sites no detailed descriptions were recorded for the whole sites during the survey. The historic remains of the Fountain Head Mine have mostly been destroyed by subsequent mining (Crassweller 2006d) and the World War II sites have been previously recorded. The survey results record only those features of each site that are located nearest to the proposed alignment.

In the vicinity of the Fountain Head Mine, BGP11 there was an area of approximately 300 x 300 metres that had been disturbed by shallow pits. While no historic material was located in the area, historic research indicates that the shallow pits may represent the diggings made by Chinese alluvial miners during the 1880s.

The main section of the No. 86 Station Hospital site is a tourist site, which is part of the Stuart Highway Heritage Trail. However the section of the site that is adjacent to the proposed pipeline alignment is located on another ridge approximately 500 metres northwest from the tourist site. It consists of numerous concrete slab floors and leveled stony floors, a drain and small glass and tin dumps. An Aboriginal archaeological site consisting of a small stone artefact scatter and a quarry were also identified in the southern section of the historic site. The most northern features consist of a gravel road from Fountain Head Road to the southern features of the historic site, a structure of 44-gallon drums and the remains of two upright timber poles.

The only historic features noted at the 404th Quartermaster Platoon Stores were concrete slab floors.

Fenton Camp is an extensive area with numerous concrete slab floors near Oolloo Rd. For a distance of approximately two kilometres south west from the main camp are several other features that consist of six gun emplacements, a line of 44-gallon drums used for target practice, a small scatter of glass bottles and tins and four 'chuffers' that were used as coppers when washing clothes. These objects are made from of a 44-gallon drum on its side where a hole had been cut and a small 'chimney' attached.

The survey for a proposed access track across the southern section of the boundaries of Fenton Airfield did not identify any historic material and followed fence lines and existing tracks. The latest route, version F does not use this access track.

There were numerous isolated World War II dumps located during the survey. BGP9 –12 and 16 and 17 are dumps and scatters that contain typical objects such as beer bottles, tins and 44-gallon drums. In the area of a proposed construction camp near KP250 there were eight World War II dumps scattered over an area that had been used as a gravel pit.

An historic cattle yard BGP23 was located on Tipperary Station. It was unusual as it still contained the remains of a branding fence. It appears that the yard may have been rebuilt in the past as only the four corner poles showed that originally the yard fence had been built using the post and rail construction. The fence now consists of six wire strands, not barbed, that are threaded through holes drilled into all the poles.

Three other sites have been recorded and have been assessed as having no historic or archaeological significance as they contain objects that appear to be relatively recent. These three sites are on Tipperary Station east of the homestead. BGP21 consist of two small stone cairns on the top of a hill and aluminium tags nailed onto nearby trees. BGP22 is an exploratory drilling site and contains plastic bags containing excavated material. BGP24 appears to be the base of a 10 metre wide grain tank built from aluminium sheets.

The proposed pipeline alignment will not disturb the historic North Australian Railway Line, as the pipeline will cross the railway line in an area where the line has been rebuilt for the Darwin to Alice Springs Ghan Railway.

6.5. Assessment of archaeological and heritage significance

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 International Council on Sites and Monuments (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 representativeness, 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 survey have been ranked according to their perceived significance.

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, and
- A site provides information contributing to a broader understanding of the history of human occupation.

It should be noted that historical significance would not necessarily be equated with archaeological significance, as some events may leave nothing in the archaeological record. A summary of the significance assessment for each site is recorded in Table 6.3. The detailed assessments are in Appendix 2.

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 few previously recorded sites in certain areas along the pipeline route, 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 was collected during the survey. Larger sites with a higher density of artefacts were given a moderate significance as these sites have the potential for answering questions regarding settlement patterns, stone artefact manufacture and subsistence strategies in regions where there has been very little previous archaeological research. The detailed justification for the significance assessments of each site is found in Appendix 3. The deemed significance for each site is summarised in Table 6.3.

Table 6.3. Summary of the significance of sites located during the survey

Site No.	Significance	Comments
BGP1	High	Rarity -low frequency of scarred trees in the Top End.
BGP2	Low to moderate	Artefact scatter with low density and diversity of stone artefacts
BGP3	Low to moderate	Artefact scatter with low density of stone artefacts, some disturbance
BGP4	Moderate to high	Diversity and density of archaeological material
BGP5	Low	Low density artefact scatter, all artefacts have been recorded in detail
BGP6	High	Rarity of stone arrangements, high cultural significance
BGP7	Low	Low diversity and density of artefacts in artefact scatter
BGP8	Low	Low density of artefacts, possible disturbance of artefact scatter.
BGP9	Low to moderate	WWII dump, research potential.
BGP10	Low	WWII dump, low density scatter
BGP11	Low to moderate	Chinese alluvial mine pits, lack of historic material present
BGP12	Low	WWII dump, low density scatter
BGP13	Low	Small quarry, low diversity and density of artefacts
BGP14	High	No. 86 Station Hospital World War II historic site
BGP15	High	404 th Quartermaster Platoon Stores World War II historic site
BGP16	Low	WWII dump, low density scatter
BGP17	Low	WWII dump, low density scatter, disturbed
BGP18	Low and moderate	WWII dump, Feature 3 has a high density and diversity of objects
BGP19	High	World War II historic site
BGP20	Moderate	Small quarry, research potential
BGP21	None	Relatively recent site
BGP22	None	Relatively recent site
BGP23	Moderate to high	Relatively intact historic cattle yard
BGP24	None	Relatively recent site

- **High significance**

The remains of three of the historic sites, BGP14, 15 and 19 (No. 86 Station Hospital, 404th Quartermaster Platoon Stores and Fenton Camp) have been assessed as having high historic significance as they were important facilities used during World War II. Two of the archaeological sites, BGP1 a scarred tree, and BGP6, the stone arrangement, have been assessed as having high archaeological and cultural significance. Scarred trees are not common as trees in the Top End tend

to be destroyed by fires or by termites. The high archaeological significance of the stone arrangement is based on the rarity of the site type and also the cultural and historic significance for Aboriginal people.

- **Moderate to high significance**

One of the archaeological sites BGP4 has been assessed as having moderate to high archaeological significance. This site is distinctive because of its unusual combination of stone artefacts, grinding hollows, grindstone and knapping floors and has been assessed both on the rarity of grinding hollows in an open site and the potential for archaeological research on the stone assemblage for understanding the procurement and manufacture of stone artefacts in the region.

The cattle yard BGP23 has also been assessed as having a moderate to high historic significance as it is relatively intact and contains the remains of a branding fence, which is an uncommon feature in historic cattle yards.

- **Moderate significance**

The small stone quarry BGP20 may represent a single event of procuring and manufacturing stone artefacts, which has some research potential for understanding the use of stone resources in the area. Consequently this site has been assessed as having moderate significance.

- **Low and low to moderate significance**

The remaining stone artefact scatters have been assessed as having low or low to moderate archaeological significance as the density of the stone artefacts is low, there is little variation in the type of raw material or artefact type and / or there has been disturbance at the site. These factors lower their research potential.

BGP11 consists of an area disturbed by historic alluvial mining activities. As this site contains no historic objects it has been assessed as having low archaeological and historic significance.

The World War II rubbish dumps and scatters BGP10, 12, 16 and 17 have been assessed as having low archaeological and historic significance as they represent a common site type and the artefacts within the sites are the usual items found at this site type. As the rubbish dump, BGP9 at Air Force Hill consists of two dense piles of material there is the potential for research into the life of a remote outpost during World War II and has consequently been assessed as having low to moderate archaeological and historic significance, as has Feature 3 at BGP18. Feature 3 is the largest and densest scatter of material at BGP18 and has the potential for investigating variations between the objects used by the American and Australian troops who lived at Fenton Camp during different periods.

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.

7.0. POTENTIAL IMPACTS AND RECOMMENDATIONS

This section describes the potential impacts on the identified archaeological and historic sites that may occur during the construction and operational stages of the project. Recommendations are made to protect or to mitigate the loss of any archaeological or historic values to the sites located on or adjacent to the 30 metre wide pipeline alignment and to ensure that no offences are committed under the *NT Heritage Conservation Act 1991*.

During the design stage when the route was being plotted in the field the alignment was realigned around the majority of sites to avoid any disturbance to them. However the pipeline was not realigned around the background scatters of isolated stone artefacts as they have low archaeological significance and their attributes were recorded in the field.

A section of the proposed pipeline alignment between KP38 and the Moyle River KP84 was surveyed during the Trans Territory Pipeline survey (Crassweller 2004) and was not re-examined during this survey. As the exact location of the TTP pipeline route was not identified during that survey in 2004, there may be unidentified cultural material along this section. The proponents for the TTP project had undertaken to have all the pipeline alignment surveyed by an archaeologist when surveyors were pegging the route. Therefore it is recommended that an archaeological survey should be carried out over the 30 metre wide pipeline alignment between KP38 and the Moyle River.

7.1. Construction phase

7.1.1 Recommendation for archaeological sites and objects

Several of the archaeological sites listed in Table 7.1 are located 20 metres or more from the edge of the alignment and they are close enough to be concerned about accidental disturbance during the construction of the pipeline. Therefore it is recommended that temporary fences are constructed along the edge of the 30 metre wide alignment nearest to each site for a distance of 100 metres. This action will ensure that heavy machinery or vehicles will not accidentally disturb the site. The length of the fence will also make it difficult for people to identify the Aboriginal sites and perhaps disturb the contents. The construction of all fences should be monitored by an archaeologist to ensure there is no disturbance to the sites. Detailed recommendations for the other sites are listed below.

- **BGP1, BGP4 and BGP5**

These sites are located outside of the 30 metre wide alignment and will not be directly disturbed by the construction of the pipeline. To ensure the sites are not disturbed it is recommended that a temporary 100 metre long fence should be constructed between the sites and the pipeline alignment before construction commences.

- **BGP2**

This stone artefact scatter is located on the northern banks of Tom Turners Creek where the pipeline will be underground. As the end of the HDD string line is approximately 40 metres north of the site there is the potential for vehicle disturbance in the area of the site. Therefore it is recommended that a temporary fence should be constructed 5 metres north of the site to ensure the site is not disturbed.

- **BGP3**

This is a small stone artefact scatter located between the Daly River-Wadeye Rd and the proposed pipeline alignment. There is the potential that access to the pipeline from the road may

disturb the site. Consequently it is recommended that a temporary fence should be constructed around the site five metres from the edge of the site.

- **BGP6**

It is recommended that, before there is any disturbance in the area, a permanent fence is constructed 5 metres from the base of the stone cairn at BGP6 as this site has high archaeological and cultural significance. There is also the possibility that vibrations from the use of heavy machinery in the area may disturb the site. Therefore it is also recommended that either a traditional owner and / or an archaeologist should monitor the site when heavy machinery is used for the construction of any access tracks or the pipeline in the area.

- **BGP7**

This stone artefact scatter site will be destroyed by the construction of the pipeline. It was not possible to realign the pipeline alignment due to terrain constraints. As the site has been assessed as having low archaeological significance, permission should be sought from the Minister for Natural Resources, Environment and the Arts (NRETA) to destroy the site before construction commences.

- **BGP8**

As this site is located on the edge of the 30 metre wide pipeline alignment there is a high potential that a section of this site will be disturbed during the construction phase. This is a small low density artefact scatter that has been assessed as having low archaeological significance. While it is recommended that a 100 metre long fence is constructed along the northern edge of the alignment, it is possible that the fence may also disturb the southern section of the site. Therefore to ensure that there is compliance with the provision of the *Northern Territory Heritage Conservation Act 1991* permission should be sought from the Minister for Natural Resources, Environment and the Arts (NRETA) to disturb the site.

- **BGP13, BGP14 and BGP20**

As these sites are located between 50 and 170 metres from the pipeline alignment they will not be disturbed by the development. Therefore no action is required.

- **Background scatters of isolated stone artefacts, BS1-BS25, BS30-BS44 and BS21, BS22 and BS78 recorded during TTP survey**

For three of the 43 background scatters located along the pipeline alignment will be either disturbed or destroyed during the construction of the pipeline. As these objects have been assessed as having low archaeological significance and their attributes have been recorded, it is recommended that no further mitigative action is required. To ensure that there is compliance with the provision of the *Northern Territory Heritage Conservation Act 1991* permission should be sought from the Minister for NRETA to disturb the objects.

Table 7.1. Summary of recommendations for archaeological sites

Site	Action during survey	Distance of site from pipeline centreline	Potential direct impact	Recommendation
BGP1	Pipeline realigned	20m west	None	A 100 metres long temporary fence along western side of alignment
BGP2	None	Pipeline underground	None	Temporary fence 20 metres north of northern boundary of site
BGP3	Pipeline realigned	20m south	None	A temporary fence be constructed around the site
BGP4	Pipeline realigned	20m west	None	A 100 metres long temporary fence along western edge of alignment
BGP5	Pipeline	20m southeast	None	A 100 metres long temporary fence

Site	Action during survey	Distance of site from pipeline centreline	Potential direct impact	Recommendation
	realigned			along southern edge of alignment
BGP6	Pipeline realigned	20m east	None	A permanent fence constructed around the stone cairn. Site to be monitored when heavy machinery is used in the area.
BGP7	None	On the alignment	Destruction	Permission sought for site to be destroyed.
BGP8	None	On the northern edge of alignment	Disturbance	A 100 metres long temporary fence along northern edge of alignment. Permission sought to disturb the site.
BGP13	None	70m south	None	No action required
BGP14	Pipeline realigned	150m south	None	No action required
BGP20	None	50m south	None	No action required

7.1.2. Recommendations for historic sites

The most frequent features of the historic World War II sites are concrete slab floors or piles and /or scatters of bottles, tins and 44-gallon drums. These objects, unlike the majority of archaeological material are readily identifiable to non-professionals and are more visible than the smaller contents of Aboriginal sites. Therefore it is considered that the construction of temporary fences in the area of historic sites is not warranted. In order to protect the significant features of historic sites it is recommended that brightly coloured flagging tape should be placed around the historic features at risk of disturbance.

- **BGP10, BGP12, BGP16 and BGP17**

These four sites are low density World War II dumps and scatters that have been assessed as having low archaeological and historic significance. BGP10, BGP12 and BGP16 are not located within the 30 metres wide alignment. BGP17 is located in the alignment however it consists of a low density scatter of historic material. As these sites are not protected under any legislation it is recommended that no further action is required.

- **BGP9**

This World War II dump is located near the northern edge of the pipeline alignment. It has been assessed as having low to moderate archaeological significance. Therefore it is recommended that a temporary fence should be constructed along the northern edge of the 30 metre wide alignment to mitigate disturbance to the site.

- **BGP18**

Seven of the eight World War II dump sites in BGP18 will be destroyed by the construction of the camp. They have been assessed as having low historic significance. It is recommended that a temporary fence should be constructed around Feature 3 that has been assessed as having low to moderate archaeological significance.

- **BGP11**

This site consists of small pits and disturbed surfaces that are thought to have been made by Chinese alluvial gold miners. It has been assessed as having low archaeological and historic significance. As this site is not protected by any Commonwealth or Northern Territory legislation, no further action is required.

- **BGP14**

The pipeline alignment runs next to the Fountain Head Road in the area of the No. 86 Station Hospital. Sections of the surface near the road have been previously cleared and there is a

road drain parallel to the road. A gravel road that was built to the other features of the historic site will be damaged by the construction of the pipeline. A structure of 44-gallon drums, several small dumps and the remains of two upright timber poles are located on the edge of the pipeline alignment. Therefore it is recommended that the features adjacent to Fountain Head Road should be flagged before construction commences. During construction the southern side of the alignment should be made a 'no go' area for heavy machinery and vehicles. As this site is not protected by any Commonwealth or Northern Territory legislation, no further action is required.

- **BGP15**

The 404th Quartermaster Platoon Stores World War II site is 35 metres south of the centre line of the alignment. To ensure that the concrete floors at this site are not disturbed during the construction phase it is recommended that these features are flagged and the southern side of the alignment should be made a 'no go' area for heavy machinery and vehicles. As this site is not protected by any Commonwealth or Northern Territory legislation, no further action is required.

- **BGP19**

The proposed pipeline corridor crosses the southern section of Fenton Camp and was aligned to avoid the historic features that are scattered along the route for approximately 2.5 kilometres. Only Feature 4, a small scatter of glass and tins will be destroyed by the pipeline. The remaining features are 20 to 80 metres from the centre line. To ensure that the remaining features, Features 1-3 and 6-7 are not disturbed during the construction phase it is recommended that they are flagged before construction commences and that an archaeologist monitors the site during the construction stage. The area outside the 30 metre wide corridor should be made a 'no go' area for vehicles and machinery. As this site is not protected by any Commonwealth or Northern Territory legislation, no further action is required.

- **BGP23**

The historic cattle yard is outside the pipeline alignment and will not be disturbed. No further action required.

- **BGP21, BGP22 and BGP24**

These three sites consist of two small stone cairns, an exploratory mine drill site and the base of a grain tank are located outside the area of disturbance and have been assessed as having no historic or archaeological significance. Therefore no further action is required.

Table 7.1. Summary of recommendations for historic sites

Site	Action during survey	Distance of site from pipeline centreline	Potential direct impact	Recommendation
BGP9	None	On the northern edge of the alignment	Disturbance	A temporary fence along the northern edge of alignment
BGP10	None	45m south	None	No action required
BGP11	None	On the 30 metre wide alignment	Disturbance	No action required
BGP12	None	20m north	None	No action required
BGP14	Pipeline realigned	On the southern edge alignment	Disturbance	Most northern features flagged, site monitored during construction
BGP15	None	35m south	None	Most western concrete floors to be flagged.
BGP16	None	50m north	None	No action required
BGP17	None	Inside the alignment	Destruction	No action required
BGP18	Construction camp aligned to avoid Feature 3	Construction camp	Destruction to majority of features	Temporary fence to be constructed around Feature 3

Site	Action during survey	Distance of site from pipeline centreline	Potential direct impact	Recommendation
BGP19	Pipeline realigned	20m to nearest features	None	Features 1-3 and 6-7 are flagged, site monitored during construction
BGP21	Pipeline re-aligned	50m southwest	None	No further action required
BGP22	None	40m south	None	No further action required
BGP23	None	40m south	None	No further action required
BGP24	None	60m south	None	No further action required

7.1.3. Unexploded ordnance

The historic research shows that Fenton Airfield was bombed several times in 1943. Therefore there is a low potential for the presence of unexploded bombs in the area. It is recommended that all personnel working in the area of Fenton Camp should be informed of the possibility of buried unexploded ordnance.

7.1.4. Sub-surface archaeological material

There is the potential for disturbance to subsurface cultural material during the construction of the pipeline. Therefore it is recommended that a response mechanism is set up to ensure there is minimal loss of archaeological or cultural values. The response should include the immediate cessation of work around the cultural material and obtaining advice from Heritage Conservation Services to ensure that the conditions of the *Northern Territory Heritage Conservation Act 1991* are not contravened.

7.3. Operational phase

During this stage the main concern is for the on-going protection of all sites in the vicinity of the pipeline alignment. The stability of some of the sites may be particularly vulnerable to regular visitation. Therefore it is recommended that the location of all archaeological material is made available to employees only when works may impact upon a site.

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APPENDIX ONE

**Previously recorded historic and archaeological sites located
within the 30 kilometre wide study corridor.**

Historic sites listed on the Register of the National Estate located within the study corridor

RNE	Easting	Northing	Map Name	Site name
Indicative	764000	8588000	Batchelor	Brocks Creek cemetery
Registered	761700	8597000	Batchelor	Brocks Creek Township
Registered	761500	8599000	Batchelor	Brock's Creek Railway Siding
Registered	761700	8599000	Batchelor	Brocks Creek Military Detention Barrack
Indicative	763500	8588000	Batchelor	Zapopan Mine and Battery site
Registered		8593400	Tipperary	Fenton Airfield
Indicative	722700	8492500	Tipperary	Daly River Cattle Station, head station site
Registered	773300	8511600	McKinlay	Glencoe Head Station
Registered	753710	8510654	Batchelor	Big Howley Mine and Battery site
Registered	762000	8597000	Tipperary	Long Airfield
Destroyed	757100	8502200	Tipperary	Cosmopolitan Howley Mine and Battery Site

Historic sites listed on the Northern Territory registers located within the study corridor

NT Heritage	Archaeological Site Register No.	Easting	Northing	Map Name	Site name	Description
Registered		761900	8593000	Batchelor	Brocks Creek Chinese oven	
Registered		764000	8588000	Batchelor	Brocks Creek cemetery	
Registered		761700	8597000	Batchelor	Brocks Creek Township	
Registered		761500	8599000	Batchelor	Brock's Creek Railway Siding	
Registered		761700	8599000	Batchelor	Brocks Creek Military Detention Barrack	
Registered		752600	8595000	Tipperary	Fenton Airfield	
Proposed		751136	8584000	Tipperary	Crashed plane	
	5171-0004	750600	8516800	Batchelor	Railway Survey 1; Bridge Creek site 29	Historic object/place,
	5171-0009	761600	8597000	Batchelor	Brock's Creek	Building, well, fireplace
	5171-0089	751030	8512907	Batchelor	Bridge Creek site 20	Shaft, mine
	5171-0092	751088	8510432	Batchelor	Bridge Creek site 23	Shaft, mine, wall
	5171-0095	751845	8508808	Batchelor	Bridge Creek site 26	Historic object/place, also artefact scatter
	5171-0098	750800	8516750	Batchelor	Bridge Creek site 30	Historic object/place, also stone artefact scatter
	5171-0099	750800	8516750	Batchelor	Bridge Creek site 31	Historic object/place

Aboriginal archaeological sites located within the study corridor listed on the NT Archaeological Site Register

Heritage No.	Name	Easting	Northing	Map	Description
5171-0004	Railway Survey 1	750600	8516800	Batchelor	Stone artefact scatter grindstone portable
5171-0005	Railway Survey 2	754500	8513200	Batchelor	Rock painting
5171-0006	Railway Survey 3	755100	8512900	Batchelor	Stone artefact scatter
5171-0008	Railway site	744500	8521900	Batchelor	Stone artefact scatter
5171-0024	Site 15	757200	8534400	Batchelor	Stone artefact scatter
5171-0035	Dwn/AS Gas Pipeline Survey No 3	759900	8526500	Batchelor	Stone artefact scatter, stone quarry
5171-0036	Dwn/AS Gas Pipeline Survey No 4	760500	8526000	Batchelor	Stone artefact scatter
5171-0037	Dwn/AS Gas Pipeline Survey No 5	762700	8526000	Batchelor	Stone artefact scatter
5171-0060	Site 23 Goodall Gold Mine 66kV TL	765000	8523000	Batchelor	Stone artefact scatter
5171-0061	Site 24 Goodall Gold Mine 66kV TL	766900	8517500	Batchelor	Stone artefact scatter
5171-0062	Site 25 Goodall Gold Mine 66kV TL	767700	8516900	Batchelor	Stone artefact scatter
5171-0063	Site 26 Goodall Gold Mine 66kV TL	768200	8516600	Batchelor	Isolated stone artefact
5171-0064	Site 27 Goodall Gold Mine 66kV TL	768800	8516100	Batchelor	Stone artefact scatter
5171-0065	Site 28 Goodall Gold Mine 66kV TL	769300	8514300	Batchelor	Stone quarry
5171-0067	Bridge Creek 1	750800	8512600	Batchelor	Stone quarry
5171-0068	Mount Darwent 1	744500	8518900	Batchelor	Stone artefact scatter
5171-0069	Mount Darwent 2	747100	8517000	Batchelor	Stone artefact scatter
5171-0070	Bridge Creek site 1	752598	8523323	Batchelor	Stone quarry
5171-0071	Bridge Creek site 2	752754	8523614	Batchelor	Stone quarry
5171-0072	Bridge Creek site 3	753007	8522984	Batchelor	Stone artefact scatter
5171-0073	Bridge Creek site 4	752987	8523059	Batchelor	Stone quarry
5171-0074	Bridge Creek site 5	753041	8523051	Batchelor	Stone quarry
5171-0075	Bridge Creek site 6	753180	8522862	Batchelor	Stone quarry
5171-0076	Bridge Creek site 7	753731	8522789	Batchelor	Stone artefact scatter
5171-0077	Bridge Creek site 8	753967	8523247	Batchelor	Stone quarry, grindstone portable
5171-0078	Bridge Creek site 9	753980	8522987	Batchelor	Stone artefact scatter
5171-0079	Bridge Creek site 10	753115	8523998	Batchelor	Stone quarry
5171-0080	Bridge Creek site 11	753120	8524275	Batchelor	Stone quarry
5171-0081	Bridge Creek site 12	752807	8524383	Batchelor	Stone quarry
5171-0082	Bridge Creek site 13	752748	8524007	Batchelor	Stone artefact scatter
5171-0083	Bridge Creek site 14	752511	8523900	Batchelor	Stone quarry
5171-0084	Bridge Creek site 15	752539	8524184	Batchelor	Stone artefact scatter, grindstone
5171-0085	Bridge Creek site 16	752327	8523621	Batchelor	Stone quarry
5171-0086	Bridge Creek site 17	751375	8521900	Batchelor	Stone artefact scatter
5171-0087	Bridge Creek site 18	750875	8521655	Batchelor	Stone artefact scatter
5171-0088	Bridge Creek site 19	750754	8521360	Batchelor	Stone artefact scatter, grindstone
5171-0090	Bridge Creek site 21	751144	8512721	Batchelor	Stone quarry
5171-0091	Bridge Creek site 22	751227	8511786	Batchelor	Stone artefact scatter
5171-0093	Bridge Creek site 24	751135	8509869	Batchelor	Stone artefact scatter
5171-0094	Bridge Creek site 25	751409	8509183	Batchelor	Stone artefact scatter
5171-0095	Bridge Creek site 26	751845	8508808	Batchelor	Stone artefact scatter,
5171-0096	Bridge Creek site 27	753252	8523262	Batchelor	Stone quarry
5171-0097	Bridge Creek site 28	753521	8523885	Batchelor	Stone quarry
5171-0098	Bridge Creek site 30	750800	8516750	Batchelor	Stone quarry

Heritage No.	Name	Easting	Northing	Map	Description
5170-0001	Corkscrew Pass 1	770200	8497600	Tipperary	Stone artefact scatter, rock painting
5170-0002	Corkscrew Pass 2	770100	8497800	Tipperary	Stone artefact scatter, rock painting, rock engraving
5170-0004	Hayes Creek 1	769800	8497000	Tipperary	Stone artefact scatter

Historic and archaeological sites located within the study corridor and identified from various sources

Easting	Northing	Map sheet	Description
750700	8516800	Batchelor	Bridge Creek bottle Dump
750800	8516900	Batchelor	Bridge Creek Settlement
761300	8592000	Batchelor	Chinese and WW11 Scatter
768100	8593000	Batchelor	Fountain Head Cattle Yards
771450	8510200	Batchelor	Fountain Head Mine
768100	8592000	Batchelor	Fountain Head Railway Siding
754500	8512900	Batchelor	Howley Creek Railway Bridge
757100	8512000	Batchelor	Howley Railway Reservoir
756800	8512200	Batchelor	Howley Railway Siding
763200	8592000	Batchelor	Iron Oven Site
755000	8512700	Batchelor	Quartz Reef Hotel Site
761500	8511400	Batchelor	WW11 rubbish dump
761800	8510900	Batchelor	WW11 rubbish dump
761800	8511000	Batchelor	WW11 rubbish dump
763100	8591000	Batchelor	Zapopan Manager's site
776000	8516400	McKinlay	Woolwonga Battery and Chinatown Site
775900	8516700	McKinlay	Woolwonga Diggings and Main Shaft
748900	8597000	Tipperary	Radar directed searchlight unit camp site
759100	8501000	Tipperary	404 th Quartermaster Platoon Stores
760100	8503200	Tipperary	No. 86 Station Hospital
753500	8496500	Tipperary	Fenton Camp and group headquarters
754000	8499800	Tipperary	Camp site origin unknown Level ground below a rise
754500	8497600	Tipperary	Radar station
758900	8489100	Tipperary	No. 5 American Airways Communication System
560800	8423900	Keats	39 Radar Station
13° 23'S	131° 42'E	Pine Creek	Crashed Lockheed 10, Ban Ban Springs, some major components in situ
13° 35'S	131° 17' 10"E	Tipperary	Crashed B-24 Liberator Tipperary Station, Fenton, Major components in situ plaque
13° 35'8"S	131° 19'18"	Tipperary	Crashed B-24 Liberator Tipperary Station creek bed
13° 34'S	131° 17'E	Pine Creek	Crashed B-24 Liberator Ban Ban Springs, Major components in situ
13° 20'S	130° 37'E	Tipperary	Crashed B-24 Liberator Tipperary station opposite control tower, Fenton
13° 38'S	131° 18'E	Tipperary	Crashed B-24 Liberator , Fenton, rear fuselage removed, commemorative plaque
13° 37'55"S	131° 20'30" E	Tipperary	Crashed B-24 Liberator Tipperary Station end of Fenton runway Major components removed
13° 37'S	131° 21' E	Tipperary	Crashed B-24 Liberator Tipperary Station adjacent to old emergency runway, major components removed
751782	8510561	Batchelor	Bridge Creek Detour Site 1, Stone Artefact Scatter
750789	8512651	Batchelor	Bridge Creek Detour Site 2, Stone Artefact Scatter
751019	8511996	Batchelor	Bridge Creek Detour Site 3, Stone Artefact Scatter
771512	8509987	McKinlay	FH1, Stone Artefact Scatter
775306	8504522	Pine Creek	PL1, stone artefact scatter
775594	8504616	Pine Creek	PL2, stone artefact scatter
775808	8507366	McKinlay	NP1, stone artefact scatter
775809	8507323	McKinlay	NP2, stone artefact scatter

APPENDIX TWO

Details of pedestrian transect

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
3.11.06	79	1	614198	8421386	2200	70			HDD string for Moyle	Pinkerton	Alluvial plains to creek, silty, sandy banks, open forest
	79	2	614198	8421386	790	80		1	Pipeline, southern crossing Moyle	Pinkerton	Open forest, highly disturbed by OFC, sandy levee banks
	80	3	614325	8421572	1904	70			Pipeline, northern crossing Moyle	Pinkerton	Sandy bank stony hills and alluvial plains
	82	4	614718	8423020	480	70			Pipeline	Pinkerton	Boggy swamp, patches of stony areas, black soils
	83	5	613737	8424500	900	60			Pipeline	Pinkerton	Along Nian Creek, woodlands, silty soils
	85	6	613549	8424606	1660	75			Pipeline	Pinkerton	Between Nian creek and steep stony ridge, alluvial plain
	87	7	614477	8427128	900	80			Pipeline	Angallari	Black soil plain, open woodland
	88	8	615470	8427612	1400	50			Construction camp	Angallari	Alluvial plain, o'woodland not burnt black silty soils
4.11.06	88	1	615334	8427190	1000	95			Construction camp	Angallari	Gravelly plain
	90	2	616607	8428372	300	80	1	2	Pipeline	Angallari	Kurrowa Creek, silty banks on flood plain
	91	3	619470	8431766	1100	70		3	Pipeline	Angallari	Kurrowa Creek crossing, silty, clayey banks
	93	4	619970	8432088	300	<5			Pipeline	Angallari	Flood plain
	95	5	620578	8432540	1080	80		4	Pipeline	Angallari	Stoney hill and flood plain
	96	6	620778	8422803	300	90		5	Pipeline	Angallari	Base of rocky hill, o'woodlands
	97	7	621037	8432956	1000	90		6	South HDD string for Tom Turners	Angallari	Tom Turner Creek stony hill sandy plain, o'woodland
	97	8	621485	8433064	600	70	2		North HDD string for Tom Turners	Angallari	Tom Turner Creek, sandy silty rise, o'woodland
	100	9	624572	8432912	1440	65			Proposed quarry	Angallari/Pinkerton	Stoney slope of hill o'woodlands, existing borrow pit
5.11.06	100	1	624655	8432614	400	80			Pipeline	Angallari/Pinkerton	Stony ridge, o'woodland
	102	2	626010	8432728	1200	90		7	Pipeline	Pinkerton	Stony hill, quartzite, patches quartz stone, o'woodland, borrow pit
	102	3	626381	8432952	515	95			Pipeline	Pinkerton	Stoney hill, quartzite, small patches quartz stone, o'woodland,
	103	4	627014	8433448	1200	90			Pipeline	Litchfield	Black soil plain, occasional trees
	104	5	628070	8433800	1200	80	3		Pipeline	Litchfield	Creek on flood plain
	104	6	628573	8434230	300	85		8	Pipeline	Litchfield	Alluvial plain and lower slopes of stony hill
	106	7	630790	8435326	1700	85			Construction camp	Litchfield	Gravelly soils, undulating o'woodland
	107	8	630122	8435512	250	85			Pipeline	Litchfield	creek next to borrow pit, o'woodland gravelly stony soils
	108	9	630618	8435992	720	85		9	Pipeline	Litchfield	Sandy, gravelly creek banks flood plain o'woodlands
	110	10	632748	8437942	1900	90		10	Pipeline	Litchfield	Undulating lateritic, gravelly and silty plain, o'woodlands

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
6.11.06	113	1	634937	8440456	300	90			Pipeline, CP ground bed	Litchfield	Floodplain, open low woodland, gravelly patches
	121	2	641102	8445042	300	86			Pipeline	Litchfield	Silty gravelly plain, low o'woodlands
	123	3	643642	8447404	1200	95&<5			Pipeline	Litchfield	Silty creek crossing on floodplain, grassland
	126	4	644359	8447960	750	80			Pipeline	Litchfield	O'woodland, gravelly sandy soil, undulating and small floodplain
	129	5	648821	8450320	1000	75			Gravel pit	Litchfield	Gravelly soils on edge of stoney hill. Existing gravel pit
	132	6	650675	8450072	800	80		11	Pipeline	Litchfield	Alluvial plain, tall open forests, sandy gravel soils, patches unburnt veg.
8.11.06	134	1	652258	8450586	4800	80			Pipeline	Litchfield	Sandy creek crossing, flood plain, low o'woodland
	138	2	655002	8451146	950	85		12	Pipeline	Litchfield	Crossing at Sandy Creek, steep banks, 2 channels o'woodlands
	138	3	656356	8451378	520	90		13	Pipeline	Litchfield	Sandy creek crossing, flood plain, low o'woodland
	139	4	657367	8451908	1600	80			Pipeline	Litchfield	Sandy alluvial plain, o'woodland, patches gravel
	140	5	658659	8452432	400	95			Pipeline	Litchfield	Sandy creek crossing, flood plain, low o'woodland
	142	6	659296	8453446	2000	95		14	Scraper and CP areas, tracks	Litchfield	Alluvial plain o'woodland gravel patches, small billabong
	146	7	661339	8458068	910	85		15	Pipeline	Litchfield	Undulating silty terrain, small black soil plains, gravelly rises
	152	8	664927	8460390	1580	80			Pipeline	Litchfield	Creek, sandy plain, gravelly low rises
9.11.06	156	1	668573	8462808	1400	85	4		Pipeline	Litchfield	Creek sandy slopes low rocky outcrops
	159	2	671319	8464816	700	85			Pipeline	Litchfield	Along creek, sandy banks, undulating, o'woodland
	160	3	672715	8465740	920	85		16	Pipeline	Litchfield	Stony rise, creek, o'woodland
	163	4	674023	8466548	250	85			Pipeline	Litchfield	Creek, rocky sandstone ridge, silty sandy , o'woodland
	164	5	675341	8467384	720	90			Pipeline	Litchfield/Copeman	Undulating silty soils, woodland
	166	6	676418	8468136	800	90		17	Pipeline	Litchfield/Copeman	Creek, silty banks, gravel rises both sides
	167	7	677285	8468764	600	60	5		Pipeline	Litchfield/Copeman	Creek, silty banks, gravel rises both sides
	168	8	678631	8467806	100	45			Pipeline	Brocks Creek	Sandy creek, stony rises and plain
	169	9	679472	8469740	940	80			Pipeline	Brocks Creek	Sandy creek, stony rises and plain
	171	10	680871	8468950	900	85			Pipeline	Brocks creek	Sandy creek, stony rises and plain
10.11.06		1	681390	8475870	2800	80			Quarry	Brocks Creek	Undulating gravelly soils, low o'woodland
		2	683818	8469674	1470	90			Access track	Brocks Creek/Copeman	stony low slopes, edge billabong, o'woodland
	172	3	681537	8467910	1010	80		18	Pipeline	Copeman	Creek. billabong closed woodland, undulating stony plain
	174	4	683006	8467420	800	<5			Pipeline	Copeman	Chilling Creek both sides, flood plain, gullies and base of stony hills

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
	176	5	685076	8468446	5600	90	6,7	20, 21,22	Pipeline	Pinkerton	Steep stony/rocky ridges
	177	6	684870	8468350	800	70			Pipeline, HDD for south Daly River	Pinkerton	High silty banks, lower rocky slopes
	172	7	682882	8476296	1820	50			Pipeline	Brocks Creek/Copeman	Chilling Creek both sides, flood plain, gullies and base of stony hills
	174	vehicle	684275	8467922		70		19	Access track	Copeman	Treeless floodplain
15.11.06	214	1	721160	8476980	1600	5			Construction camp	Tagoman	Cleared paddock dense grass on red soils
	214	2	721434	8476036	200	50			CP ground bed	Tagoman	Ephemeral creek, sandy and silty soils, surface disturbed
16.11.06	219	1	725049	8478166	1200	20			Pipeline	Tagoman	Silty alluvial plain, reforested, pandanus and open woodland
	217	2	723698	8476814	1260	15			Pipeline	Tagoman	Alluvial plain open woodland
	213	3	719151	8477126	400	40			Pipeline	Tagoman	Silty plain , low ridge, small valley, gravel patches
	210	4	716413	8477270	2400	80		23,24	Pipeline	Tagoman	Low limestone o'crop on top of undulating hill
	208	5	715196	8477306	520	50			Pipeline	Tagoman	Creek on undulating plain, majority surface cleared
	205	6	711830	8476724	500	30			Pipeline	Green Ant	gravelly, sandy undulating plain, low open wood land
	202	7	709406	8475574	900	25			Pipeline	Kimbyan	Cleared paddock, 2 year growth, undulating plain
	201	8	708762	8475254	200	5			Pipeline	Kimbyan	Creek, one bank stony, the other silty
	201	9	708563	8475116	360	90			Pipeline	Kimbyan	Creek, stony rises on both sides
	200	10	707910	8474916	450	85			Pipeline	Kimbyan	Undulating stony plain
	200	11	707217	8474560	400	85			Pipeline	Kimbyan	Stony low rise next to alluvial plain
	199	12	706821	8474346	780	90			Pipeline	Kimbyan	Low limestone outcrop on plain, o'woodland silty soils
	198	13	705388	8473736	1700	90			Pipeline	Buldiva	Undulating stony and silty plains o'woodland
	195	14	713161	8472592	400	5			Pipeline	Buldiva	Silty plain, grassland and open woodland
	194	15	702120	8472032	1800	90			Pipeline	Buldiva	Undulating silty plain and base of low stony hills
17.11.06	192	1	699859	8471276	280	70		25	Pipeline	Buldiva	Stony ridge, open woodland
	191	2	699533	8471202	600	20			Pipeline	Tipperary	Creek, silty sandy banks, open woodland
sil	186	3	694660	8470332	1150	80			Pipeline	Tipperary	Creek, silty soils undulating open woodland
	188	4	696707	8470516	195	90			Pipeline	Tipperary	Stony ridge adjacent to black soil flood plain
	189	5	697472	8470702	410	90			Pipeline	Tipperary	Stony rise open woodland
	190	6	698515	8470900	300	90			Pipeline	Tipperary	Stony undulating open woodlands
	221	7	726778	8479460	400	70			Pipeline	Green Ant	Western side of Green Ant Creek steep bank silty and laterite soils

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
	221	8	726760	847942	3000	5			Pipeline	Green Ant	Between Green Ant creek and tributary, silty flood plain, weeds, low
21.11.06		1	573044	8415394	1600	75			Access track (won't be used)	Mullaman	Open forest, cycads, sandy silty soils lower slopes of stony ridge
		2	571453	8416174	1720	80		26,27,28	Pipeline, (won't be used)	Mullaman	Undulating gravelly hills, open forest
		3	570043	8416496	600	80			Pipeline, (won't be used)	Mullaman	Steep stony ridge and alluvial plain
		4	567967	8416560	400	30			Pipeline, (won't be used)	Mullaman	KP24, on old alignment, stony top of ridge
		5	562609	8423744	240	60			Pipeline, (won't be used)	Moyle	Black soil plain, adjacent to Port Keats Rd
		6	568296	8422126	1200	70			Pipeline, (won't be used)	Moyle	Silty plain, open woodland, adjacent to Port Keats Rd
		7	571486	8421046	1210	60			Pipeline, (won't be used)	Moyle	Open forest, red soils , sandy soil plain, ironstone outcrops
	28	vehicle	570418	8416316		60		29	Pipeline, (won't be used)	Moyle	Undulating gravelly hills, open forest
22.11.06	16	1	560401	8423812	1100	65	8	30	Realigned pipeline	Moyle	Lower slopes Airforce Hill, stony o'woodland, black soil drainage line
	20	2	563287	8423634	960	50			Realigned pipeline	Moyle	Creek vertical western bank sandy silty eastern bank
	20	3	563287	8423634	1900	90		31	Realigned pipeline	Moyle	Black soil plain, low stony rises, disturbed by old tracks
	16	4	560609	8423852	300	80	9		Realigned pipeline	Moyle	Lower slopes Airforce Hill, stony o'woodland, black soil drainage line
	18	5	561253	8423528	500	80		32	Realigned pipeline	Moyle	Lower stony slopes
	19	6	562093	8422758	1520	90	10		Realigned pipeline	Moyle	Black soil plain, low rises stone and gravel
		vehicle				40		33	Access track (won't be used)	Moyle	Low stony rise open forest
4.12.06	285	1	773593	8518368	840	85		34	Gravel pit	Bend	Low stony hill next to black soil plain
	284	2	773710	851770	760	95			Pipeline	Bend	Alluvial plain, patches of gravel, silty creek, o'woodland
		vehicle				85			access track	Bend	Gently undulating low o'woodland
	284	3	773302	8516430	400	65		35	Pipeline	Bend	Small creek silty plain, Melaleuca woodland
	283	4	773074	8515600	2600	75		36	Pipeline	Bend	Alluvial silty plain, small creek, Melaleucas
5.12.06	281	1	771988	8512656	950	80			Pipeline	Bend	Low granite outcrops, alluvial plain
	278	2	771017	8511534	3800	80			Pipeline	Bend	Alluvial plain, creek, small dry billabong, clayey, silty soil
	276	3			1000	90			Access track	Bend	Alluvial plain, clayey silty soil
	275	4	770266	8510932	1400	90	11		Pipeline	Bend	Alluvial plain, clayey silty soil
	276	5	769070	8509296	400	40			HDD under railway line	Bend	Highly disturbed
	273	6	767775	8507305	2400	60			Anode bed	Bend	undulating plain, stony low hills
	271	7	766460	8506402	500	<5			Pipeline	Bend	Creek, dense vegetation silty clayey soils

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
	269	8	764155	8505372	280	90			Pipeline	Bend	Creek/ billabong, undulating grassland o'woodland
	268	9	763174	8505044	625	80	12		Pipeline	Bend	Alluvial plain, slopes of low stony hill
	266	10	761407	8504298	600	80	13		Pipeline	Bend	Edge of undulating country tuff o'crop, creek
	265	11	761042	8504050	450	75			Pipeline	Bend	Skeletal soils, rocky o'crop next to small alluvial plain
	264	12	760806	8503914	500	85			Pipeline, (won't be used)	Bend	steep stony hill
6.12.06	264	1	760469	8503624	800	75			Realigned pipeline	Baker	Small alluvial valley between hills
	264	2	760806	8503914	800	75	14		Realigned pipeline	Baker	Edge of stony hill adjacent to Fountain Head Rd
	263	3	759876	8502902	2000	75			Pipeline	Baker	Lower slopes of stony hill and small alluvial plains
	262	4	759181	8501734	800	80	15		Pipeline	Baker	Edge of stony hill adjacent to Dorat rd
	260	5	758813	850290	800	80			Pipeline	Baker	stony/gravelly hill, creek alluvial plain, woodlands
	260	6	758144	8499602	600	90			Pipeline	Baker	Quartz o'crop on stony hill
	259	vehicle	757715	8499338		80		37	Pipeline	Bend	Undulating stony hill
	258	8	756709	8498564	400	90			Pipeline	Bend	Silty sandy undulating plain, creek
	257	9	756471	8498424	1290	85	16	38	Pipeline	Bend	Low stony hills, alluvial plain
	256	10	754787	8497090	1060	75			Pipeline	Bend	Undulating silty, stony plain, creeks o'woodland
	254	11	754240	8496664	500	30	17	39	Pipeline	Bend	Creek crossing pig and cattle damage
	256	12	755694	8498368	3900	85	18		Construction camp	Bend	existing gravel pit, gently undulating stony/silty surface
7.12.06	253	1	753469	8496018	600	65	19		Realigned pipeline	Bend	Undulating plain adjacent to Dorat rd
		vehicle				65	19		Realigned pipeline	Bend	Undulating plain, o'woodland
	252	2	753200	8495430	800	65	19		Realigned pipeline	Bend	Undulating plain, 'woodland
	250	3	750836	8494304	550	60		40	Pipeline	Bend	Creek crossing silty banks
	247	4	748614	8492960	400	<5			Pipeline	Bend	Creek crossing silty banks, dense grass
	246	5	747844	8492544	300	40		41	Pipeline	Bend	Creek crossing silty banks, stony undulating hills
	246	6	747644	8492454	400	90	20	42	Pipeline	Bend	Creek crossing silty banks, stony undulating hills
	245	7	746422	8491652	500	90			Pipeline	Bend	Creek crossing silty banks, undulating plain
	244	8	745402	8491216	800	85		43	Pipeline	Bend	Undulating o'woodland, quartz and dolerite o'crops
		9	744080	8490864	400	80			Pipeline	Bend	Stony low hill
	243	9	744252	8490962	400	85	21		Pipeline	Bend	Creek, stony undulating hills

Date	KP	Transect	Easting	Northing	Distance	Vis. %	Site	B/S	Area	Land system	Description
	242	10	743964	8490808	450	95		44	Pipeline	Bend	Creek, stony undulating hills
8.11.06	242	1	743548	8490716	600	90	22		Pipeline	Bend	stony hill low open woodland
	241	2	742208	8490328	500	85			Pipeline	Bend	Undulating stony gravelly plain , low open woodlands
	240	3	741696	8490172	1400	60			Pipeline	Bend	Low limestone o'crop, red silty sandy plain
	238	4	740885	8489608	2010	50			Pipeline	Jindara	Large limestone O'crop, red silty soil plain some previously cleared
	232	vehicle	735867	8485132		90	23		Pipeline	Kimbyan	Undulating red silty plain, revegetated
	232	5	735867	8485132	900	80			Pipeline	Tagoman	Undulating red silty plain, revegetated
	231	6	735570	8484866		60			Pipeline	Tagoman	Undulating red silty plain, revegetated
	230	7	734164	8483616	300	50			Pipeline	Tagoman	Undulating red silty plain, revegetated
	227	vehicle	732147	8481760		80	24		Pipeline	Tagoman	Undulating red silty plain, revegetated
	226	8	731360	8481196	200	90			Pipeline	Tagoman	Low limestone o'crop on undulating plain, semi-cleared
	224	9	729867	8480586	3800	95			Pipeline	Tagoman	Undulating red silty plain, revegetated and burnt
	222	10	727344	8479530	800	10			Pipeline	Green Ant	Woodlands, grasses around Green Ant Creek
9.11.06	182	1	690460	8469285	4500	80			Pipeline and HDD, Daly River north side	Tiperrary	Woodlands, drainage lines, flood plain

APPENDIX THREE

Details of archaeological and historic sites

BGP1

Scarred tree.

Location: 52 616610E 8428366N 1:100,000 Map Sheet:

Land system: Angallari

The tree is located approximately 10 metres south of an ephemeral creek that runs across the flood plains. The tree has died and will probably be destroyed by the next fire to go through the area. The scar is at the base of the trunk and is 450cm long and there are numerous cut marks that have left scars 30cm long. While the scars are quite faded they appear to be quite shallow and may have been made by a metal tomahawk to extract sugar bag (pers. com. Richard Woolfe).

Site's and relationship to proposed development. The tree is located on the edge of the 30 metre wide pipeline easement.

Archaeological significance: As scarred trees are relatively rare in the Top End this tree has been assessed as having high archaeological significance



BGP1 close up of axe marks



BGP1, scarred tree

BGP2

Stone artefact scatter.

Location: 52 621260E 8433064N Moyle 4969 1:100,000 Map Sheet:

Ground visibility: 65%

Dimensions: 26m N-S, 12m E-W

Land system: Angallari

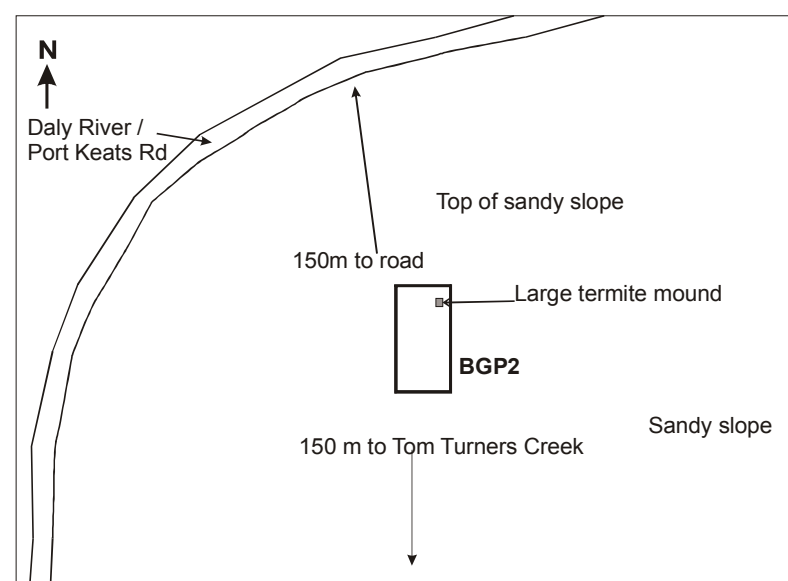
The stone artefact scatter is located on the slope of a gentle sandy slope covered in open woodland and is adjacent to the northern side of Tom Turners Creek. The Daly River - Port Keats Road creek crossing is approximately 150 metres west of the site and the road is approximately 150 metres to the north of the site. Half of the slope had been recently burnt resulting in a surface visibility of 85%. The unburnt section, which tended to be on the upper section of the slope had a surface visibility of 50%. A large termite mound is located near the northeast corner of the site.

The highest density of artefacts is eroding out in an area of approximately 5 x 2 metres that has been affected by sheet wash. The maximum density of artefacts in this area is 5 per square metre while the average for the whole site is 0.4 per square metre. The artefacts are manufactured from either quartzite or silcrete and consist of unretouched flakes and cores (5%). No retouched flakes artefacts were identified. The flakes ranged in length from less than 10mm to 50mm.

Site's and relationship to proposed development. This site will not be directly disturbed by the construction of the pipeline as, in this area the pipeline will be drilled under the creek and under the site. However it may be disturbed during drilling activities as the end of the drilling will occur approximately 50 metres north of the site.

Archaeological significance: There has been very little archaeological research in the region. Consequently there is a moderate to high research potential for any sites located in the area. However as the stone assemblage at this site has only a low diversity and density of archaeological material, the site is assessed as having low to moderate archaeological significance.

Sketch of BGP2 (not to scale)





Northern section BGP2, facing northwest



BGP2 facing south from termite mound



Artefacts on BGP2

BGP3

Stone artefact scatter.

Location: 52 628068E 8434144N Moyle 4969 1:100,000 Map Sheet:

Ground visibility: 80%

Dimensions: 5 x 5m

Land system: Litchfield

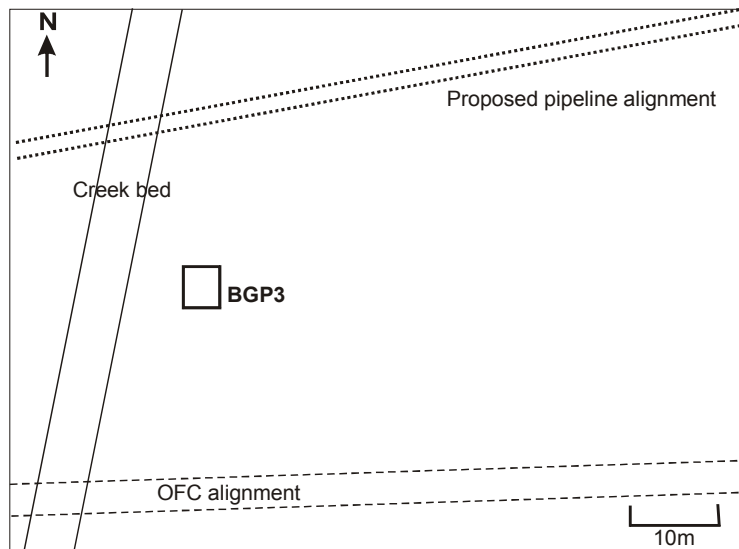
The site is located five metres from the northern bank of a creek that runs across a sandy, silty plain covered in open woodlands. The dry creek bed is approximately 5 metres wide with steep banks and has a base of cobbles. The construction of the optic fibre cable has disturbed the surface adjacent to the eastern section of the site.

The artefacts are eroding from a gentle slope in an area that has sheet wash erosion. Average artefact density is 0.8 per square metre and the artefacts have been manufactured from either quartzite or silcrete and consist of unretouched flakes and retouched flakes (10%). No cores were identified. The maximum length of the flakes was 35mm and the average was 25mm. One sandstone grindstone was also located at the site.

Site's and relationship to proposed development. The pipeline was realigned in the field so that the site will be 20 metres south of the proposed pipeline

Archaeological significance: There has been very little archaeological research in the region. Consequently there is a moderate to high research potential for any sites located in the area. While this site has a relatively diverse stone assemblage there is only a low density of archaeological material and there has been some surface disturbance in the area. Therefore the site is assessed as having low moderate archaeological significance.

Sketch of BGP3





BGP3, facing west from the OFC alignment



Sample of artefacts from BGP3



BGP4

Stone artefact scatter, knapping floors, grinding hollows.

Location: 52 668852E 8463122N Daly River 5070 1:100,000 Map Sheet:

Ground visibility:

Dimensions: 6m N-S, 14m E-W

Land system: Litchfield

This site is located on a gently undulating slope 200 metres north of an ephemeral creek and its small flood plain. The surface consists of silty, gravelly soils, low rock outcrops and open woodland with numerous *Livistona* palms. The southern section of the site had been disturbed by several pig diggings.

The site consists of three knapping floors (0.5 x 0.5m) surrounded by a less dense scatter of artifacts. The maximum artefact density within the knapping floors was estimated to be 25 artefacts per square metre and there was an average density of 0.4 between the knapping floors. The length of the flakes in the three knapping floors was between 10 and 20mm and there was a high proportion of very small quartz waste flakes less than 10mm long and two multiplatform quartz cores.

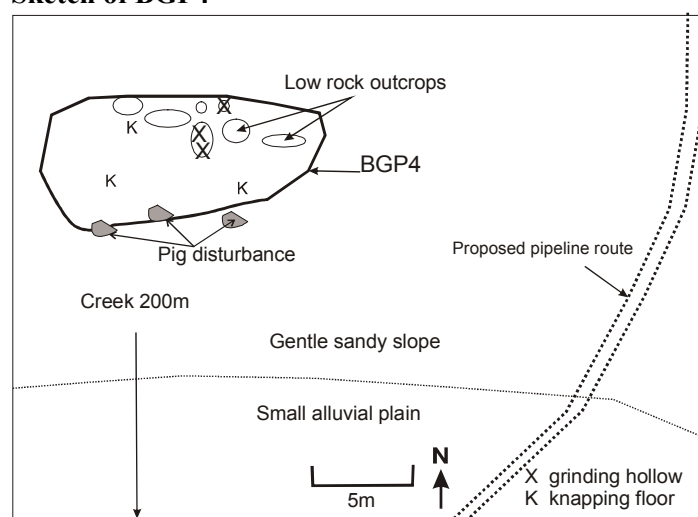
The two retouched flakes identified at the site were manufactured from quartzite, which made up 20% of the raw material at the site. Also identified were two banded chert unretouched flakes, a quartzite blade flake (50mm in length) and a broken grinding stone.

There were three grinding hollows that were approximately 60mm in diameter on the low rock outcrops. Two grinding hollows were on the same rock outcrop.

Site's and relationship to proposed development. The pipeline was realigned in the field so that site will be 20 metres west of the proposed alignment

Archaeological significance: The presence of knapping floors, grinding hollows and a grindstone indicate that various subsistence activities were carried out at this site in the past. This suite of features is uncommon in an open site in the Top End. The knapping floors and the presence of three raw materials have the potential for research into the manufacture of stone artefacts in the region. The site is relatively intact as the pig diggings at the site have only disturbed an area where the density of artefacts is very low at less than 0.1 artefacts per square metre. Therefore this site has been assessed as having moderate to high archaeological significance based on the rarity of the features and potential for research.

Sketch of BGP4





BGP4 facing northwest



One of the knapping floors, BGP4



Sample of artefacts BGP4



Two grinding hollows, BGP4



One grinding hollow, BGP4

BGP5

Stone artefact scatter.

Location: 52 677390E 8468950N Daly River 5070 1:100,000 Map Sheet:

Ground visibility: 90%

Dimensions: 8m NW-SE, 4m NE-SW

Land system: Litchfield

This is a low density artefact scatter on the edge of a low gravelly/ undulating stony rise 40m north east of an ephemeral creek and small flood plain. The rise is covered in open low woodlands.

The maximum density of artefacts was three artefacts per square metre and the average density was 0.1 artefacts per square metre, ie only 14 artefacts were identified at the site. The artefacts were scattered evenly across the site and consisted of quartz 70% and equal proportions of quartzite and silcrete. The quartz artefacts included a flake retouched on both laterals (32 x 21 x 30) and a core (23 x 40 x 10).

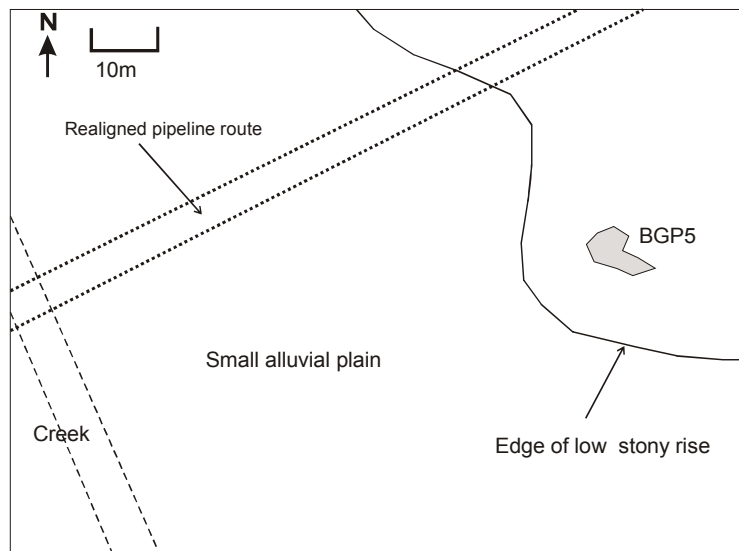
Details of artefacts.

Raw material	Type	LWB (mm)	Comments
quartz	retouched flake	32x21x3	both laterals
quartz	unretouched flake	20x22x2	
quartz	unretouched flake	19x13x2	
quartz	core	23x30x10	from large flake
quartz	unretouched flake	12x19x3	
quartz	unretouched flake	17x20x2	
quartz	unretouched flake	24x10x3	
silcrete	unretouched flake	20x19x13	proximal
quartzite	unretouched flake	13x20x2	
silcrete	unretouched flake	30x30x12	step term
quartzite	unretouched flake	22x28x6	platform prep
quartzite	unretouched flake	20x30 3	dorsal
silcrete	unretouched flake	28x19x3	
quartzite	unretouched flake	10x8x2	

Site's and relationship to proposed development. The pipeline was realigned in the field so that the site will be over 20 metres southeast of the proposed alignment.

Archaeological significance: There has been very little archaeological research in the region. Consequently there is a moderate to high research potential for any sites located in the area. However as this site consists of a low density and diversity of artefacts and all have been recorded in detail it has low research potential and low archaeological significance.

Sketch of BGP5



BGP5, facing northwest

BGP6

Stone arrangement.

Location: 52 685861E 8468563N Daly River 5170 1:100,000 Map Sheet:

Ground visibility: 95%

Dimensions: 4.5 x 4.5 x 0.9m

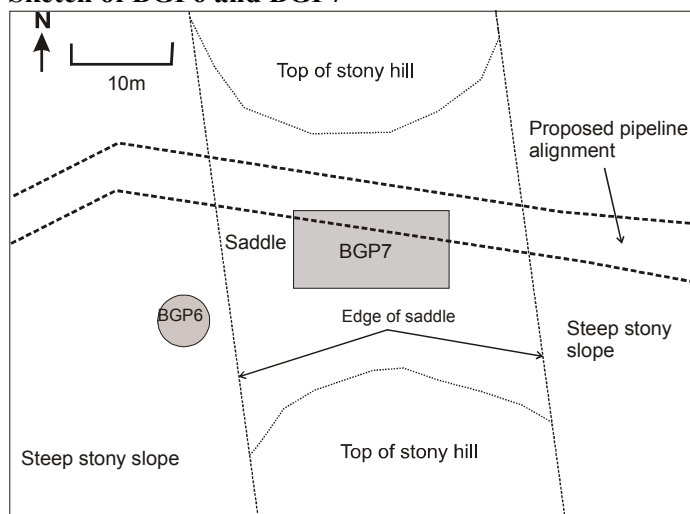
Land system: Pinkerton

The stone arrangement consists of a stone cairn built just below the level ground of a small saddle between two rocky hills and overlooks the floodplains of Chilling Creek to the south. The cairn has been built from the local sandstone raw material. Stone artefact scatter BGP7 is located north of the cairn on the saddle and there is a worn footpath over the saddle (see photo of BGP7). While the presence of the stone cairn and the stone artefacts could be used to infer that the path was made by humans, it is also possible that animals could have taken advantage of the saddle to cross the ridge.

Site's and relationship to proposed development. The pipeline was re-aligned in the field so that the site will be 20 metres south of the proposed alignment

Archaeological significance: It is thought that this cairn is most likely an 'increase site'. This site type was formed over many years by people who placed a stone on the cairn to assist in the renewal of a particular resource. It represents a material expression of Aboriginal beliefs and has important cultural significance. As there is no previously recorded 'increase sites' in the region, this site has been assessed as having high archaeological and cultural significance.

Sketch of BGP6 and BGP7



BGP6 facing north



BGP facing east

BGP7

Stone artefact scatter.

Location: 52685825E 8468575N Daly River 5170 1:100,000 Map Sheet:

Ground visibility: 95%

Dimensions: 8m E-W 15m N-S

This stone artefact scatter is located on the level saddle on the top of the steep sided ridge of hills. The saddle is covered in low open woodland and a stony surface. The northern side of the saddle overlooks the Daly River and the southern side overlooks the floodplains of Chilling Creek. It is a steep climb to either side of the saddle.

There is no area where the artefacts were found in a concentration greater than 3 artefacts per square metre. Twenty-one artefacts were identified resulting in an average density of 0.18 artefacts per square metre. All the flakes were less than 30mm in length except for one quartzite flake that was 65mm in length. Sixty percent of the flakes were manufactured from chert, and the remainder were in equal proportions of either quartzite and quartz. Only one of the flakes was retouched. It was manufactured from quartz and was retouched on both laterals.

Site's and relationship to proposed development. The stone artefact scatter is located in the centre of a small saddle over which it is proposed to build the pipeline. There is no room on the saddle for the alignment to be shifted away from the site. Consequently this site will be destroyed during the construction of the pipeline.

Archaeological significance: This is a low density artefact scatter with a high proportion of the stone assemblage manufactured from chert. This raw material is uncommon south of the Daly River. As chert is the dominant raw material in the southern Daly Basin region (Thorley 2002) the chert artefacts in this site may have been carried along the river from the south east. The average length of the flakes was relatively small indicating that the source of the raw material was not nearby. However as there is a low density and diversity of artefacts, the site has low research potential and has been assessed as having low archaeological significance.



BGP7, facing north



BGP7, facing south east



Sample of artefacts on BGP7

BGP8

Stone artefact scatter.

Location: 52 560609E 8423852N Keats 4869 1:100,000 Map Sheet:

Ground visibility: 70%

Dimensions: 5m N-S, 8m E-W.

Land system: Moil

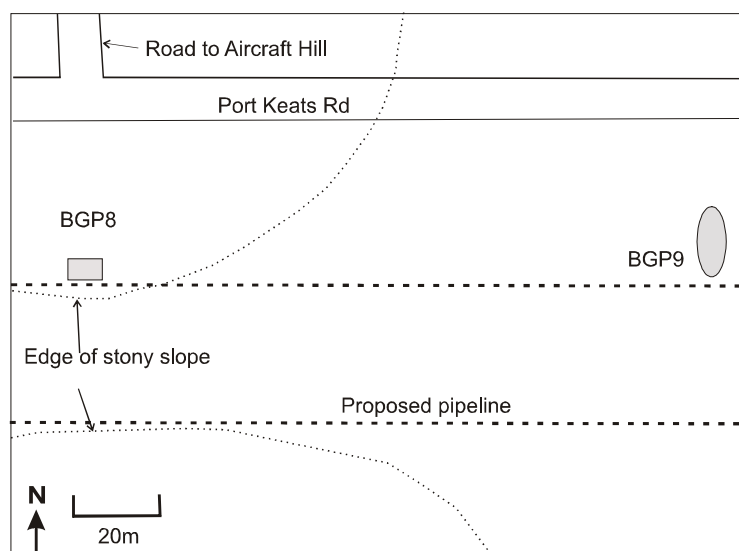
The site is located on the southern side of the Port Keats Road on a gentle stony slope at the base of the stony steep sided Aircraft Hill. The access road to the top of Aircraft Hill is north of the site. There is a small floodplain / drainage line south of the site that is bounded in the south by the lower slopes of another steep sided hill. The vegetation consists of open woodland, which appears less dense at the site than the surrounding area.

There is a background scatter (BS 30) of seven isolated artefacts that extend for 200 metres to the west along the same stony slope. The stone artefact scatter had an average density of 0.25 artefacts per square metre and a maximum density of 4 artefacts per square metre. The artefacts were manufacture from either quartzite (80%) or silcrete (20%) and one chert artefact. Retouched flakes, which included a unifacial point, made up 5% of the assemblage. No cores were identified at the site. The average length of the flakes was estimated to be 25mm and ranged from 10-80mm in length.

Site's and relationship to proposed development. This artefact scatter is located 30 metres south of the edge of the Port Keats Rd. As the proposed pipeline will be constructed 60 metres from the road, the site will be on the edge of the pipeline corridor.

Archaeological significance: The stone assemblage contains a low density of artifacts, which have only a low research potential for further research. As the site is located adjacent to a World War II site the artefacts may have been disturbed during this period. Therefore the site has been assessed as having low archaeological significance.

Sketch of BGP8 and BGP9





BGP8, facing north



BGP8 facing east



Sample of artefacts, BGP8



BGP8 from Port Keats Rd, facing south

BGP9

WWII historic dump site.

Location: 52 560747E 8423856N Keats 4869 1:100,000 Map Sheet:

Ground visibility: 80%

Dimensions: 18m N-S 10m E-W 0.5m high

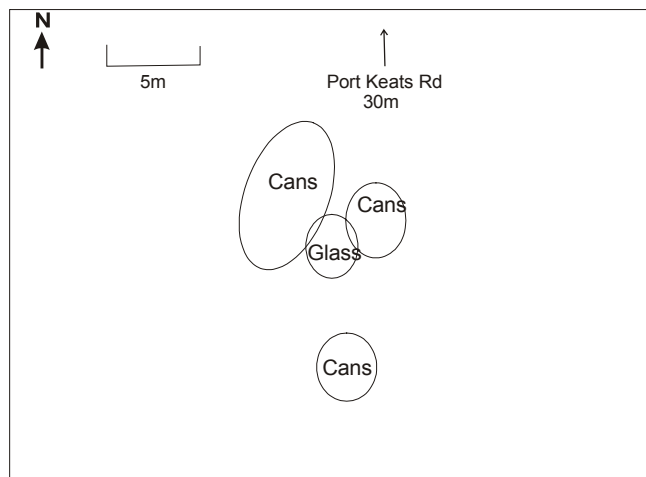
Land system: Moyle

The World War II dump is located 150 metres east of the stone artefact scatter BGP8 on level ground southeast of the base of Aircraft Hill. It consists of four dumps of refuse. The northern pile consists of three overlapping but discrete piles. Two contain both round and rectangular tins some of which are embossed with '1203 Swift Australian Corned Beef. Swift Aust. Co. Pty Ltd'. Larger flour tins are also present one of which the sides had been cut into a star shape. There is also one *Terebralia* sp. marine shell. The third dump contains the remains of glass bottles both clear glass and beer bottles, some marked on the base with '1939', '1943', '1944' 'RBR' or 'MI31' or 'NSW Bottle Company' around the base of the side of the bottle. The fourth dump is located approximately six metres south of the main dump and is made up of tins. The northern dump covers an area of 9 x 7 metres and the southern dump 4 x 3.5metres.

Site's and relationship to proposed development. This historic site is located 30 metres south of the edge of the Port Keats Rd. As the proposed pipeline will be constructed 60 metres from the road the site will be on the edge of the pipeline corridor.

Archaeological / historic significance: World War II rubbish dumps are a common historic site in the Top End. As the density of material at this site is high there is the potential for research into the way of life at a very isolated World War II camp, the 39 Radar Station, which was located nearby. Therefore the site has been assessed as having low to moderate archaeological significance

Sketch of BGP9, distribution of historic material





BGP9, facing north



BGP9 northern dump



BGP9, beer bottle bases



BGP9, corned beef tin



BGP9, flour tin



BGP9, broken glass bottles and jars

BGP10

WW11 historic dump

Location: 52 562093E 8422758N Keats 4869 1:100,000 Map Sheet:

Ground visibility: 85%

Dimensions: 50m N-S, 25m E-W

Land system: Moyle

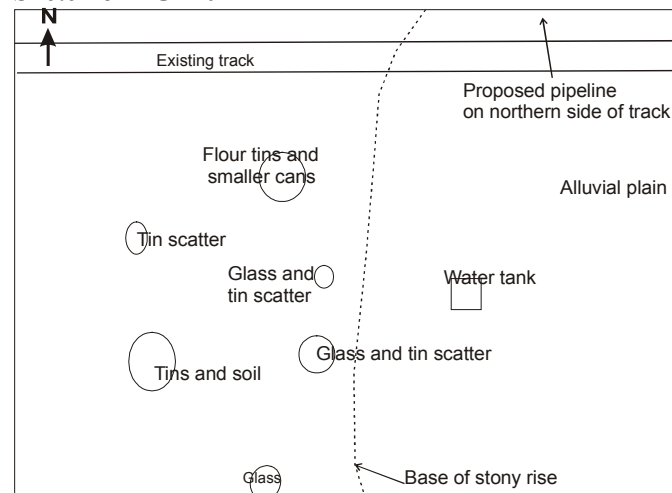
This World War 11 dump consists of six small discrete scatters of discarded material spread over the top and side of a low stony rise. The material consists of broken glass, flour tins and smaller food tins similar in type to those found in BGP9. One large water tank (1.5 x 1.5 x 1.5m) has been discarded on the level ground next to the rise.

Three stone artefacts were also located on the top of the rise (BS32)

Site's and relationship to proposed development. This site is located 10 metres south of the existing track. The proposed pipeline will be constructed on the northern side of the track and the edge of the alignment is approximately 30 metres from the northern section of the site. Therefore the site will not be disturbed during the construction of the pipeline.

Archaeological / historic significance: World War II rubbish dumps are a common historic site in the Top End. As the density of artefacts at the site is low and consist of the usual type of bottles and tins found in all World War II dumps, the site has only a low research potential. The only unusual item present is the large water tank. Therefore this site has been assessed as having low archaeological and historic significance.

Sketch of BGP10



Large water tank, facing west



Large water tank, facing east



BGP10, facing north



BGP10, facing northeast

BGP11

Fountain Head Chinese mining diggings.

Location: 770266E 8510922N Batchelor, 5171, 1:100,000 Map Sheet:

Ground visibility: 65%

Dimensions: 300 x 300m

Land system: Bend

The surface in this area has been disturbed by numerous shallow pits. No historic objects were located in the area.

Site's and relationship to proposed development. The proposed pipeline alignment will cross this area in an south west direction.

Archaeological significance: The historical data indicates that a large area around Fountain Head Mine was disturbed by Chinese alluvial miners during the 1880s and that there was a substantial settlement during this period. As no historic objects associated with 19th century mining were identified along the pipeline alignment it would appear that the Chinese settlement was not in this area. The interpretation that the shallow pits are the remains of alluvial mining is based on only historic data alone. Due to the lack of material culture in the area of the pipeline alignment the area has low research potential. It has been assessed as having low to moderate historic significance as the site is associated with events in human occupation and demonstrates a past way of life.



BGP11, facing northeast

BGP12

WW11 dump

Location: 762641E 8504866N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 80%

Dimensions: 3m E-W 6m N-S

Land system: Bend

This World War II dump is located on the lower slopes of a stony hill near the Fountain Head Road. It contains beer bottles, tobacco tins, food tins, Worcestershire bottles and more recent wine bottles. There are gravel pits on both sides of the dump.

Site's and relationship to proposed development. This site is located 20 metres north of the proposed alignment.

Archaeological significance: As this site contains items that can be dated to the World War II activities from the dated beer bottles and also contains more recent wine bottles it would appear that the original World War II dump may have been disturbed during a later period, perhaps when the adjacent gravel pits were formed. Therefore the site has been assessed as having low archaeological and historic significance.



BGP, facing north

BGP13

Stone artefact scatter / quarry

Location: 761403E 8504294N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 80%

Dimensions: 12m E-W, 20m N-S.

Land system: Bend

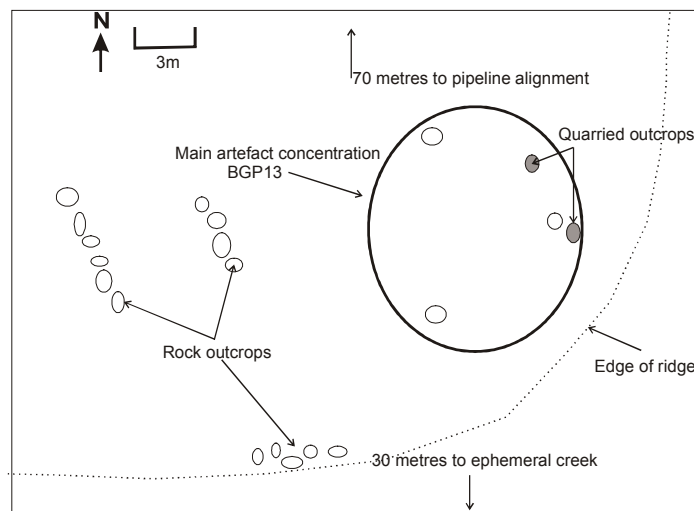
This site is located at the edge of the undulating plain where there are low outcrops of Gerowie tuff and stony skeletal soils covered in open *Eucalyptus* woodland. An ephemeral creek is located in a small valley, approximately 30 metres south of the edge of the ridge. Many of the outcrops have been damaged by natural exfoliation.

There are two areas of 3 x 3 metres where there is a low density of stone artefacts surrounding the outcrops that have been quarried (0.2 artefacts per square metre). The density of artefacts between the quarry areas is very low, less than 0.1 artefacts per square metre. The artefacts consist of unretouched tuff flakes and large cores and a minor frequency of quartz unretouched flakes. There was one tuff bifacial point. The average length of the tuff unretouched flakes was 40mm. Several of the embedded tuff outcrops had negative flake scars and the largest tuff core was 110mm in length.

Site's and relationship to proposed development. BGP13 is located 70 metres south of the proposed pipeline alignment and will not be disturbed by the development.

Archaeological significance: This small site has a low diversity and density of stone artefacts and tuff quarry sites are a common site type in the region. Therefore the site has low research potential and low archaeological significance.

Sketch map of BGP13





BGP13, facing southeast



Example of artefacts from BGP13



Two tuff cores from BGP13.

BGP14

WW11 camp - No 86 Station Hospital US Army, stone quarry and artefact scatter, contact site

Location: 7607750E 8503982N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 90%

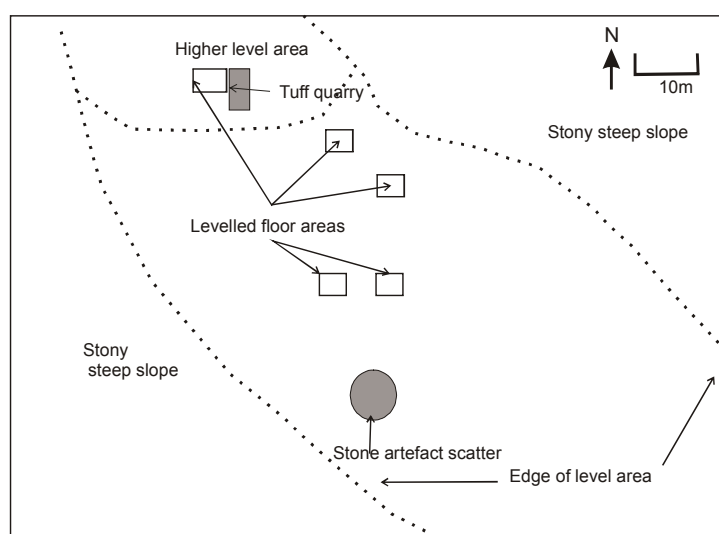
Dimensions: 100m E-W 200mN-S

Land system: Baker

The historic World War II remains are located on the northern base, sides and summit of a stony steep sided ridge approximately 500 metres north east of the section of the Hospital site that is part of the Stuart Highway Historic Trail for tourists. The site is bisected by a high voltage electricity line. The southern section also contains the remains of an Aboriginal stone artefact scatter (3 x 3 metres) and a tuff quarry (5 x 5 metres). They have been highly disturbed by the historic site which consist in this area of five leveled areas from 4.5 to 3.5 metres long that appear to be the floors of tents accommodation. Two of the tent floors have been bordered by small stones. Further south of the site are scatters of small medicine type bottles.

The quarry is located adjacent to the most northern leveled floor area and near the edge of the summit of the hill. Tuff outcrops in this area and also down the slope. However it appears to have only been quarried in this area. The flakes are large as are the cores (see photos below) and the average density of the artifacts is estimated to be 1.5 artefacts per square metre. The stone artefact scatter contains both tuff and minor frequency of chert unretouched flakes at an average density is 0.4 artifacts per square metre. It also contains the neck of a broken glass beer bottle that appears to have been retouched.

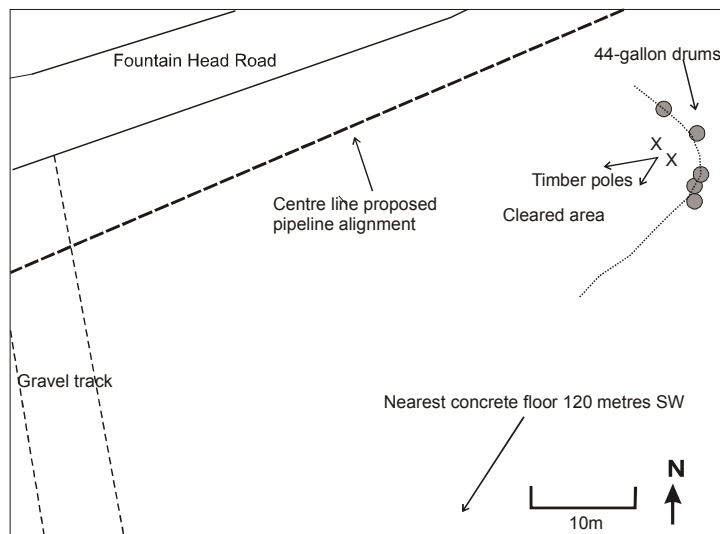
Sketch of southern section of BGP14



The northern section of the World War II site consists of a gravel track that starts at Fountain Head Road and goes to the base of the hill where there are eight concrete slab floors either on the lower or upper slopes. The most northern concrete slab is 120 metres south of Fountain Head Road. Other features include a drain into the hill, several small tent floors and scattered around the site were a metal plate, salt shaker and a belt buckle. The remains of a mast is located on the top of the hill 130 metres south west of the gravel track.

Approximately 60 metres east of the track and adjacent to the bitumen road is a cleared area that contains a disturbed structure of 44-gallon drums and the remains of two timber poles set into the ground. The 44-gallon drums are marked with either 'Atlantic Union Oil Co. Ltd' or 'Property of Air Force Army'.

Sketch of northern section of BGP14



Site's and relationship to proposed development. The pipeline was realigned during the survey so that it runs parallel to the Fountain Head Road. The most northern western feature of the camp may be disturbed during the construction of the pipeline.

Archaeological significance: This site was constructed in 1943 to provide medical aid for the USAAF 380th Bombardment Group and support units at Fenton Airfield. This site is associated with World War II activities in the area and contains a diversity of features and objects, which represent the remains of a major event associated with past human occupation in Australia it has been assessed as having high historical significance.

As the Aboriginal archaeological site has been disturbed by the World War II features the potential of the site for further research has been compromised. As the site not intact and tuff quarries in the area are a common site type the site is assessed as having low archaeological significance.



Stone artefacts at BGP13



Tuff flake at BGP13



Tuff core at BGP13



Flaked glass bottle at BGP13



Outcrops of quarried quartz



Levelled tent floor with stone boundary



Feature with 44-gallon drums and poles



Close up of a timber pole



Gravel track facing north



One of the concrete floor slabs on lower slope



From a concrete floor on hill facing north to road



Drain, facing west



Concrete slab floors on lower slopes



Concrete slab floors on upper slopes

BGP15

WW11 camp - 404th Quartermaster Platoon Stores site

Location: 759212E 8501500N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 75%

Land system: Baker

This site consists of numerous concrete slab floors on the summit and southern side of a stony hill. The site was not surveyed in detail as it has been previously recorded. The nearest historic material to the pipeline consists of three concrete slabs on the lower southern slope. There were also the remains of threaded rods and buckles used for the base of support lines to an electricity pole located on the top of the hill next to the road.

Site's and relationship to proposed development. The pipeline alignment is located along the southern side of South Dorat Road and within 40 metres of road, while the nearest concrete slab floor is 60 metres from the edge of the road. Therefore the site will not be disturbed by the development.

Archaeological significance: This site was constructed in 1943 to supply Fenton Airfield. As this site is associated with World War II activities in the area and represents the remains of a major event associated with past human occupation in Australia it has been assessed as having high historical significance

BGP16

WW11 dump

Location: 755952E 8498002N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 85%

Dimensions: 3m E-W 5m N-S

Land system: Bend

This World War 11 dump is located on the lower slopes of a low stony hill adjacent to an alluvial plain. It contains beer bottles embossed with '1941', '1942' and '1943' or 'Tooths and Co Ltd' or 'This is the property of NSW Bottle Co.', Gilbeys Gin bottles, cordial bottles and several Coca Cola bottles

Site's and relationship to proposed development. This site is located approximately 50 metres north of the proposed pipeline and will not be disturbed by the development.

Archaeological significance: Small World War II dump sites are a common site type in the area. As it contains the usual items found in these dump sites BGP16 has been assessed as having low historic and archaeological significance.



BGP16, facing northwest



BGP16, close up of bottles

BGP17

WW11 dump.

Location: 754250E 8496656N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 70%

Dimensions: 8 x 6m

Land system: Bend

This small World War 11 dump is a scatter of 44 gallon drums, beer bottles and metal objects located on the eastern side of a small creek. The area has been highly disturbed by cattle and pig diggings.

Site's and relationship to proposed development. This site is located within the proposed 30 metre wide pipeline alignment.

Archaeological significance: Small World War II dumps are a common site type in the area. As this is a low density scatter of historic material and is in a disturbed area, it has been assessed as having low historic and archaeological significance.

BGP18

Fenton WW11 dump

Ground visibility: 85%

Dimensions: 200 x 200m

Land system: Bend

Location: Tipperary 5170 1:100,000 Map Sheet

Feature	Easting	Northing	Description
1	755447	8498402	Incinerator
2	755431	8498438	Scatter of beer bottles marked 'RBR', '1941', flour tins
3	755423	8498524	Dump. Tins with 'Rheem-Aust', Brylcream jars, beer bottles, clear glass octagonal bottles with 'Brooks Lemos Ltd'
4	755606	8498160	Scatter of beer bottles
5	755480	8498420	Scatter of beer bottles and bully beef tins
6	755514	8498370	Scatter of beer bottles and bully beef tins
7	755476	8498338	Scatter of beer bottles and bully beef tins
8	755363	8498590	Scatter of beer bottles

All the above World War 11 dumps or scatters were located in an area that had been cleared and used as a shallow gravel extraction scrape.

Site's and relationship to proposed development. The proposed northern boundary of the construction camp was aligned in the field so that Feature 3 is outside the area to be disturbed. All the remaining dumps will be destroyed by the proposed construction camp.

Archaeological significance: Small World War II dump sites are a common site type in the area. All features except Feature 3 consisted of a low density of historic material that consisted of objects commonly found in World War II dumps. As Feature 3 consisted of a higher density and diversity of historic material it has the potential to provide further information on the life of people in the Fenton area during World War II and perhaps the variations between the objects used by the American and Australian troops who lived at Fenton Camp during different periods. Therefore Feature 3 has been assessed as having low to moderate archaeological significance and the other features with low archaeological and historical significance.



BGP18, Feature 3



BGP18, Feature 1 incinerator



BGP13 on gravel scrape and Feature 2

BGP19**Fenton Camp**

Location: various Tipperary 5170 1:100,000 Map Sheet::

Ground visibility: 80%

Land system: *Bend*

Feature	Easting	Northing	Feature	Distance from centre line of proposed alignment
1	753485	8496018	Fenton Camp concrete floors	20m east
2	753467	8495938	Fenton Camp concrete floor	20m east
3	753124	8495422	Fenton Camp concrete floor	20m north
4	752376	8495114	Fenton WW11 dump	on alignment
5	751254	8494434	Fenton gun emplacement	80m south
6	751219	8494544	44 gallon drum chuffers	20m south
7	751034	8494386	Fenton 44 gallon drum target	20m south

The aim of the field survey in the area of Fenton camp was ensure that no features of the camp were disturbed by the construction of the pipeline. As Fenton camp has been previously mapped and recorded in detail all the features of the Fenton camp were not recorded during this survey. The features listed above are those that are closest to the proposed alignment. Only one feature, the World War II dump will be destroyed by the proposed development.

Features 1 and 2 are located on the eastern side of Dorat Road. Feature 1 consists of two concrete floor slabs and Feature 2 is one concrete floor slab.

Feature 3 is the most southern concrete floor slab located on the northern side of Dorat Road.

Feature 4 is a small scatter of beer bottles marked 'M166' and 'M131', tins some with a screw top and a 44-gallon drum.

Feature 5 consists of 6 gun-emplacements constructed of mounded earth and 44 gallon drums.

Feature 6 consists of 4 'chuffers', (pers. com. Bob Alford) made from 44-gallon drums and a metal pipe used as a copper for washing clothes.

Feature 7 consists of a line of 44-gallon drums used as a target for shooting practice.

Archaeological significance: The individual features described above represent the diverse activities that were carried out at Fenton Camp. As Fenton camp played a major part in the defence of Darwin during World War II the site has high historic significance.



Feature 5, a gun emplacement



Feature 5, a gun emplacement



Feature 6, four 'chuffers'



Feature 7, 44-gallon drums for target practice

BGP20

Stone quarry

Location: 747625 E 8492382N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: 90%

Dimensions: 4m NE-SW 2m NW-SE

Land system: Bend

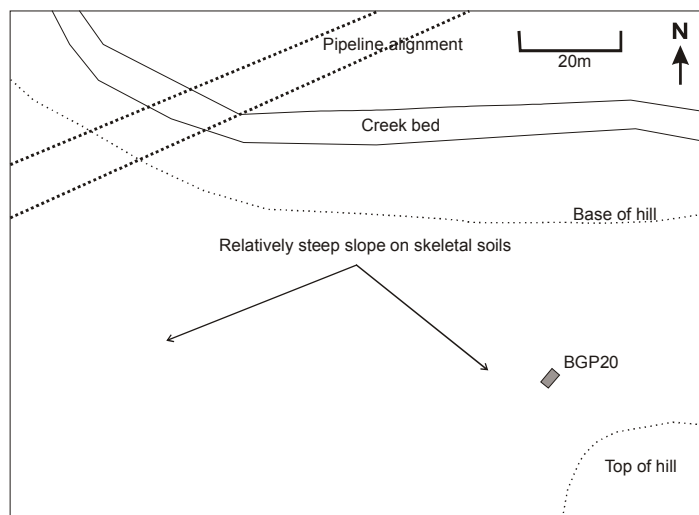
This small quartz quarry is located half way up the slope of a stony hill 50 metres south of a creek. The surface is covered in a stony gravelly surface where there are several outcrops of quartz stone. Only one of the quartz outcrops appears to have been used as a source of quartz for the manufacture of stone artefacts.

The majority of the artefacts were unretouched flakes that ranged in length from 7-30mm, the majority were less than 15mm and were located on the eastern side of the small site and appears to be the results of a single knapping event. The density of artefacts in this area was estimated to be 40 artefacts per square metre and the density for the rest of the site was estimated to be 5 artefacts per square metre. Only two quartz cores were identified at the site, however a quartz core was located on the other side of the creek approximately 70 metres north of the site (BS42).

Site's and relationship to proposed development. This site is located 50 metres south east of the proposed pipeline alignment and will not be disturbed by the development.

Archaeological significance. As this is a small compact site where local quartz had been used to manufacture artefacts it may represent a single quarrying event. Therefore the site has the potential for further research into the patterns of procurement and manufacture of stone artefact in the region and has been assessed as having moderate archaeological significance.

Sketch map of BGP20





BGP20, facing northeast



BGP20, close up of surface

BGP21

European stone cairns

Location: 744080E 8490864N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: %

Land system: Bend

There are two stone cairns approximately 10 metres apart on the top of a stony hill in an area of hills bisected by small ephemeral creeks. The cairns are approximately 50cm high and in the centre of one there is a wire peg. East of the cairns are several aluminium tags hammered on to adjacent trees. One is marked '1816'. On an adjacent hill is a 44-gallon drum that appears to line up with the two cairns at 340°

Site's and relationship to proposed development. The pipeline route was re- aligned around the hill over 50 metres to the north east and the site will not be disturbed by the proposed development.

Historic /Archaeological significance: While the function of the objects has not been ascertained the presence of the aluminium tags suggests that the objects at this site were constructed relatively recently. Consequently the site has been assessed as possessing no archaeological or historic significance.



BGP21, one of the stone cairns



BGP21, close up of cairn

BGP22

Exploratory mining drill site.

Location: 743548E 8490716N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: %

Dimensions: E-W N-S

This site is located on the lower slopes on a low stony hill. It consists of a 100 metre shallow trench into the side of the hill with an alluvial plain in the west. There is row of disintegrated plastic bags still containing the excavated material from the exploratory drilling.

Site's and relationship to proposed development. The site is located approximately 40 metres south of the proposed route.

Archaeological significance: The presence of the plastic bags indicate that this site is relatively recent. Therefore the site has no archaeological or historic significance.



BGP22, facing east

BGP23

Cattle yard

Location: 735867E 8485132N Tipperary 5170 1:100,000 Map Sheet:

Ground visibility: %

Dimensions: 35 x 35 m

Land system: Kimbyan

This site is located on a gently undulating red soil plain. There is a race and gate opening with double posts at the southwest corner of the yard and in the southwest section of the yard are the remains of a wooden branding fence. The number of wooden fence poles along each boundary range from 12 to 16. Only the corner poles of the yard had been cut for a rail, however all the poles have six drill holes for the wire, (not barbed) fence. The six posts making up the race have only one drill hole. Two of the outside wooden poles and two of the branding fence uprights have been destroyed by fire.

Site's and relationship to proposed development. This site is located approximately 40 metres south of the proposed pipeline and will not be disturbed by the development.

Archaeological significance: The remains of post and rail scars on only the four corner poles of the cattle yard suggests that the yard was rebuilt in the past and the perimeter fence was reconstructed using wire rails instead of timber rails. The presence of a relatively intact branding fence in the yard increases the historic significance of this site. As the remains of this site represent a past way of life in the pastoral industry the site has been assessed as having moderate to high historic significance.



BGP23 section of the branding fence



BGP, one side of yard



BGP23, corner pole with scars for the support of wooden rails.

BGP24

Base of grain tank

Location: 732147E 8481760N Tipperary 5170 1:100,000 Map Sheet:

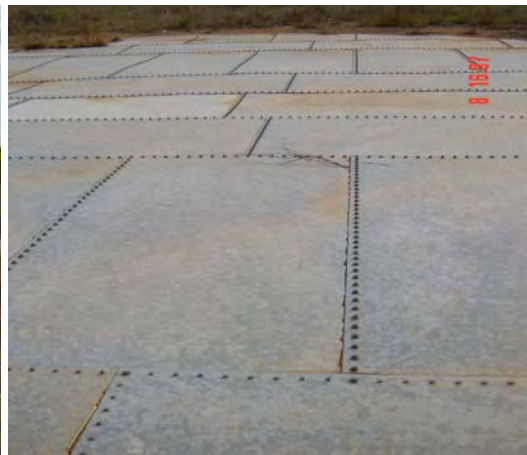
Dimensions: 10m diameter

Land system: Tagoman

This site is located on the undulating red plains that have been previously cleared and is now covered in grasslands and low open re-vegetated woodland. The only remains of the tank is the circular floor constructed from aluminium sheets bolted together. The outer edges have the floor of the tank has been riveted, possibly to connect the walls of the tank to the floor. No other structures were located in the area.

Site's and relationship to proposed development. The tank remains are located approximately 60 metres south of the proposed pipeline and will not be disturbed by the development.

Archaeological significance: This site is a relatively recent construction and therefore has no archaeological or historic significance.



APPENDIX FOUR

Details of background scatters of isolated stone artefacts

B/S	Date	Land system	Easting	Northing	Environment	Area (m)	Raw material	Type	LWB (mm)	Comments
1	3.11.06	Pi	615374	8421568	river bank	50	meta-sands.	unretouched flake	72x74x18	100% cortex
							Sandstone	grinding stone	72 x 77 x 61	
							quartzite	unretouched flake	11x11x1	
2	4.11.06	Ag	616606	8428370	creek	4	silcrete	retouched flake	32x24x10	Both laterals
							silcrete	unretouched flake	31x24x10	
3		Ag	616768	8428476	creek	300	sandstone	grinding stone	112x105x62	with percussion marks
							silcrete	unretouched flake	21x28x4	
							silcrete	unretouched flake	18x12x3	
							quartzite	unretouched flake	28x26x6	
4		Ag	620530	8432484	rocky hill/plain		sandstone	grinding stone	54x64x56	broken
5		Ag	620778	8432803	base of stony hill		sandstone	retouched flake	101x78x20	100% cortex, use wear
6		Ag	620856	8432846	creek		quartzite	unretouched flake	34x32x9	step term
7	5.11.06	Pi	626012	8432730	stony hill		quartzite	retouched flake	68x48x10	both laterals, step term
8		Lf	628706	8434392	lower slopes stony hill	5	quartzite	retouched flake	31x22x2	unifacial
							quartzite	unretouched flake	19x24x6	platform prep. step term
9		Lf	630750	8436234	creek bank	50	quartzite	retouched flake	62x36x14	
							quartzite	retouched flake	34x28x6	one margin
							quartzite	unretouched flake	42x35x7	distal
							quartzite	unretouched flake	24x26x6	proximal
							quartzite	unretouched flake	44x40x11	proximal
10		Lf	632902	8438200	creek bank	50	quartzite	unretouched flake	50x40x15	step term
							quartzite	flaked piece	22x12x2	
							quartzite	flaked piece	30x32x10	
							quartzite	flaked piece	50x30x20	
							quartzite	flaked piece	40x30x20	
							quartzite	unretouched flake	40x50x11	Feather term
							quartzite	unretouched flake	25x40x11	proximal
							quartzite	flaked piece	15x18x8	proximal

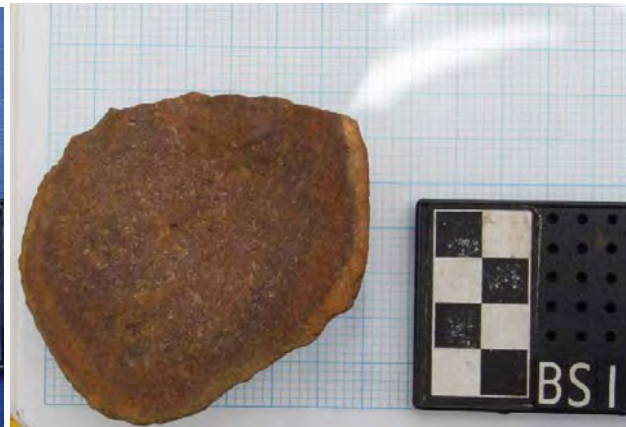
							quartzite	flaked piece	32x30x12	
11	6.11.06	Lf	635474	8440530	flood plain		quartzite	bifacial point	42x20x5	tip missing
12	8.11.06	Lf	655853	8450862	creek		quartz	unretouched flake	13x10x2	
							quartz	unretouched flake	42x43x6	distal
13		Lf	656267	8451312	low rise near creek	60	quartzite	unretouched flake	18x23x6	
							quartz	unretouched flake	23x20x3	
							quartz	unretouched flake	29x24x3	
14		Lf	659496	8453142	small billabong		quartz	unretouched flake	22x22x5	proximal
15		Lf	661457	8458110	gravel rise/ black soil plain		silcrete	unretouched flake	31x18x10	longitudinal
16	9.11.06	Lf	672783	8465776	stony rise near creek		quartz	unretouched flake	20x11x2	
							quartz	flake piece	30x20x10	
17		Lf/Co	676418	8468136	creek		quartz	unretouched flake	20x12x2	
							quartz	unretouched flake	38x27x6	
							quartz	unretouched flake	32x38x9	
18	10.11.06	Co	681553	8467896	creek		sandstone	retouched stone	17mm long	use wear on edge of unaltered stone
19		Co	684275	8467922	flood plain		sandstone	grindstone		partially buried
20		Pi	685133	8468424	lower slope of steep ridge	8	quartz	unretouched flake	33x40x15	
							quartzite	unretouched flake	22x18x6	proximal
21		Pi	685248	8468348	top of steep stony ridge		silcrete	core	70x50x40	single platform, 3 -ve scars
22		Pi	685519	8468456	small level area on ridge top	15	quartzite	unretouched flake	32x13x4	platform prep
							quartz	unretouched flake	11x6x2	
							quartzite	unretouched flake	10x8x2	
							quartz	unretouched flake	12x8x3	
23	16.11.06	Tn	716599	8477230	top of hill limestone o'crop		chert	unretouched flake	18x10x1	platform prep
24		Tn	716733	8477248	top of hill limestone o'crop	5	hornfels	unretouched flake	16x18x2	
							hornfels	flake piece	22x31x4	
							hornfels	flake piece	38x56x10	
25	17.11.06	Bu	699986	8471190	top of stony hill		silcrete	core		
26	21.11.06	Mu	571475	8416180	low gravel rise on plain		silcrete	unretouched flake	10x18x4	
27		Mu	571227	8416390	low gravel rise on plain		quartzite	unretouched flake	35x31x8	step term
							quartzite	unretouched flake	24x42x7	distal flake

28		Mu	571168	8416374	low gravel rise on plain		quartzite	core	34x39x23	single platform
							quartzite	retouched blade	38x14x6	both laterals, unifacial
							quartz	retouched flake	28x38x9	one lateral, step term
							quartz	unretouched flake	18x22x6	
29		Mo	570418	8416316			chert	unretouched flake	41x80x16	100% cortex
30	22.11.06	Mo	560586	8423844	lower slope of steep hill	200	quartzite	unretouched flake	62x60x10	
							quartzite	unretouched flake	24x14x2	
							quartzite	retouched flake	29x19x3	both margins unifacial
							quartzite	unifacial point	29x12x2	very weathered
							silcrete	retouched flake	28x18x2	both laterals
							chert	unretouched flake	19x29x10	
							chert	unretouched flake	20x24x8	distal flake
31		Mo	562925	8423428	low rise on black soil plain	30	quartzite	retouched flake	20x14x3	unifacial on both laterals
							quartzite	retouched flake	40x22x10	one lateral, use wear
							quartzite	unretouched flake	40x21x11	dorsal flake
32		Mo	562093	8422758	stony rise	20	quartzite	unretouched flake	40x25x3	very weathered
							quartzite	flaked piece	20x26x3	very weathered
							quartz	unretouched flake	20x21x4	distal flake
33		mo					quartzite	core		
34	4.12.06	Be	773636	8518428	low stony hill	30	tuff	retouched flake	60x40x20	use wear on dorsal
							tuff	retouched flake	40x30x4	distal, use wear on distal
							tuff	retouched flake	38x15x6	blade retouch one lateral, 30% cortex
							tuff	unretouched flake	50x23x10	distal
35		Be	773306	8516366	in creek bed		tuff	bifacial point	34x13x4	
36		Be	758601	8500142	small rise next to creek	30	quartz	bipolar core	40x38x22	
							tuff	unretouched flake	41x32x9	step term
							tuff	unretouched flake	41x32x9	platform prep.
							quartz	unretouched flake	41x31x10	distal flake
37	6.12.06	Be	757715	8499338	stony undulating hill		quartz	retouched flake	32x21x3	both laterals
							quartz	retouched flake	50x30x11	bifacial retouch one lateral
							quartz	unretouched flake	28x30x10	

38		Be	756373	8498402	creek stony hill		quartz	flaked piece	50x30x15	
							quartz	unretouched flake	40x25x6	distal flake
39		Be	754058	8496496	creek undulating silty plain		tuff	retouched flake	34x24x5	Steep retouch one lateral, other use-wear
							chert	manuport	28x16x12	heat damage
40	7.12.06	Be	750796	8494292	creek silty banks	50	tuff	unretouched flake	42x28x6	hinge term. very weathered
							quartz	unretouched flake	20x13x4	
							dolerite	unretouched flake	14x30x4	dorsal flake hinge term.
							quartz	unretouched flake	31x28x11	
41		Be	747672	8492606	creek alluvial plain stony hills		sandstone	grindstone	140x40x68	
42		Be	747644	8492454	creek stony hill		quartz	core	62x62x32	multiplatform
43		Be	745307	8491132	stony hill	80	dolerite	axe	170x140x50	
							dolerite	retouched flake	42x32x14	one lateral
							quartz	unretouched flake	38x40x15	
							quartz	unretouched flake	24x20x5	
44		Be	743962	849085	creek stony hill	200	quartz	unretouched flake	40x32x4	step term
							dolerite	unretouched flake	39x26x7	
							dolerite	retouched flake	38x13x5	one lateral, unifacial
21		Mo	603202	8412455	creek	400	quartzite	flaked piece	80x53x9	TTP survey
							sandstone	grinding stone	91x88x78	TTP survey
78		Mo	615079	8421486		1200	sandstone	grinding stone	82x84x55	TTP survey



BS1, grinding stone



BS1, meta sandstone flake



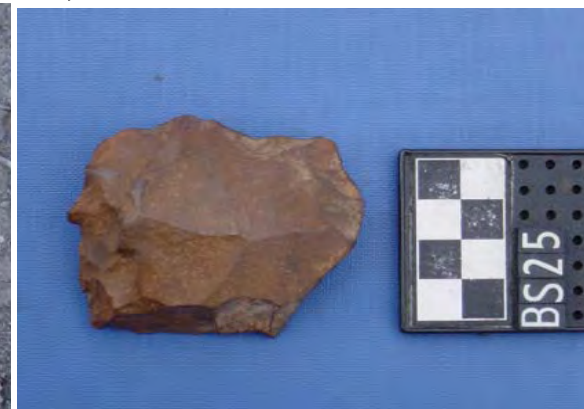
BS2, silcrete flakes



BS11, quartzite bifacial point



BS18, use wear on unaltered stone



BS25, quartzite core, multi-platform



BS30, quartzite flakes including unifacial point



BS34, tuff retouched flake



BS39, tuff flake with steep retouch



BS41, sandstone grindstone slab



BS40, tuff, dolerite and quartz flakes



BS43, dolerite stone axe