Appendix 24.
Cultural Heritage Management Plan

PNX Metals' Fountain Head Gold Project and Haul Road – Cultural Heritage Management Plan (CHMP)

A report to ERIAS Group

by Karen Martin-Stone
22 July 2020

PNX Metals' Fountain Head Gold Project and Haul Road – Cultural Heritage Management Plan

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Version notes:

Version	Author	Date	Changes
V1.0	Karen Martin-Stone	07/06/2020	First draft
V2.0	Karen Martin-Stone	17/07/2020	Final draft with minor amendments
V2.1	Karen Martin-Stone	22/07/2020	Minor amendments to Table 6

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1.0 Introduction

Erias Group engaged Karen Martin-Stone, principal archaeologist of In Depth Archaeology, to develop a cultural heritage management plan (CHMP) for PNX Metals' Fountain Head Project, for the environmental impact assessment. In Depth Archaeology undertook an archaeological survey and assessment including the haul road route for the Hayes Creek Project and Fountain Head Project site (see Appendix A). The Hayes Creek Project sites were surveyed in 2016 (Martin-Stone, 2016 – see Appendix B). The survey area is located approximately 170km south of Darwin, in the Pine Creek region (see Figure). The Hayes Creek Project includes establishing a new haul road between Mount Bonnie and Fountain Head, via Iron Blow; mining at both Mount Bonnie and Iron Blow. The Hayes Creek Project has been placed on hold while PNX Metals focus on the development of the Fountain Head Project. The Fountain Head Project includes constructing and operating a heap leach and processing facility and mining of the open pit at Fountain Head (see Figure 2).

The purpose and scope of the CHMP is to provide clear procedural guidance to enable the proponent to meet heritage management compliance standards within the existing regulatory framework. It will provide practical guidance for the recognition, protection and management of the archaeological resource for all phases of the proposed project.

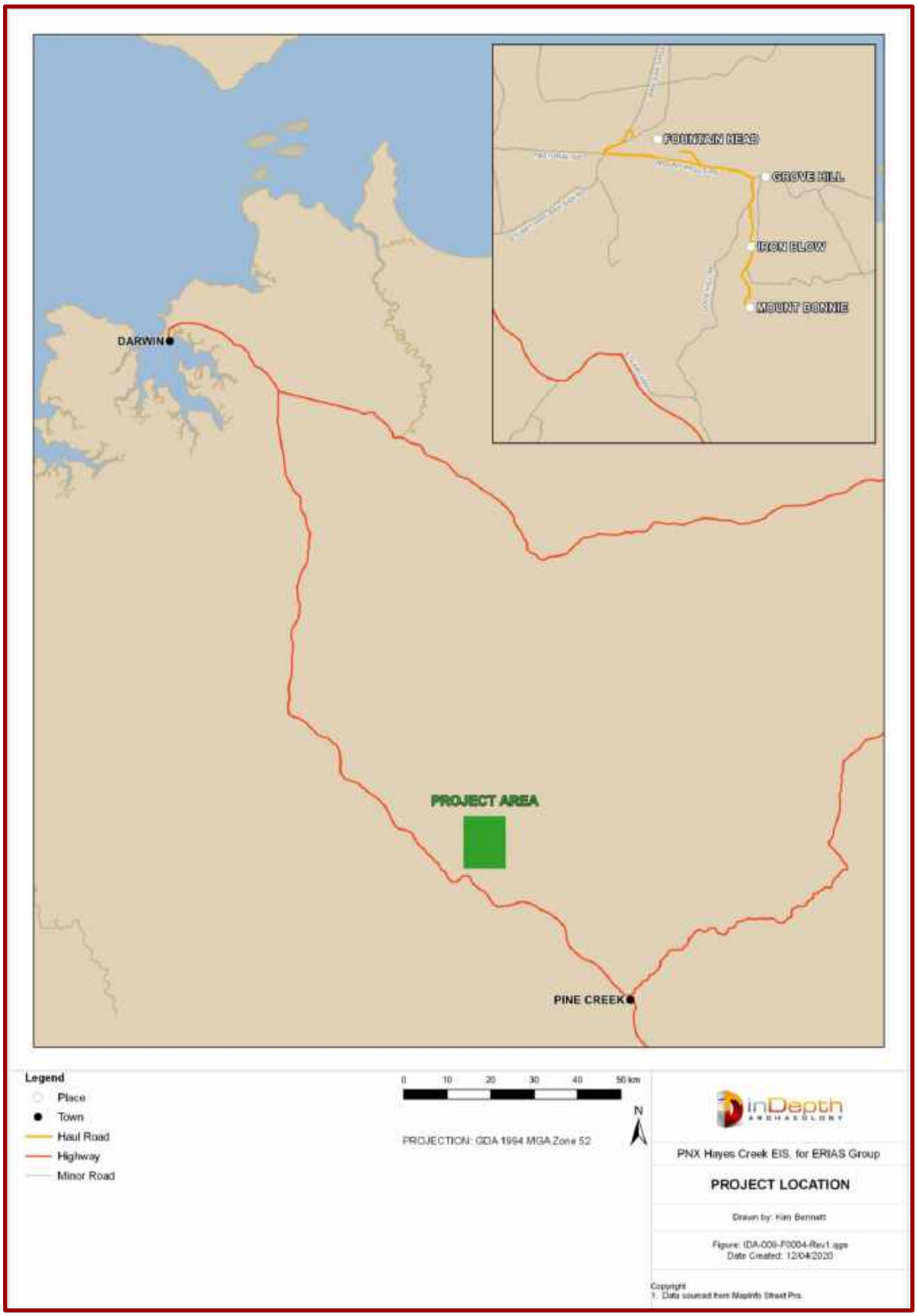

Figure 1: Location of project area

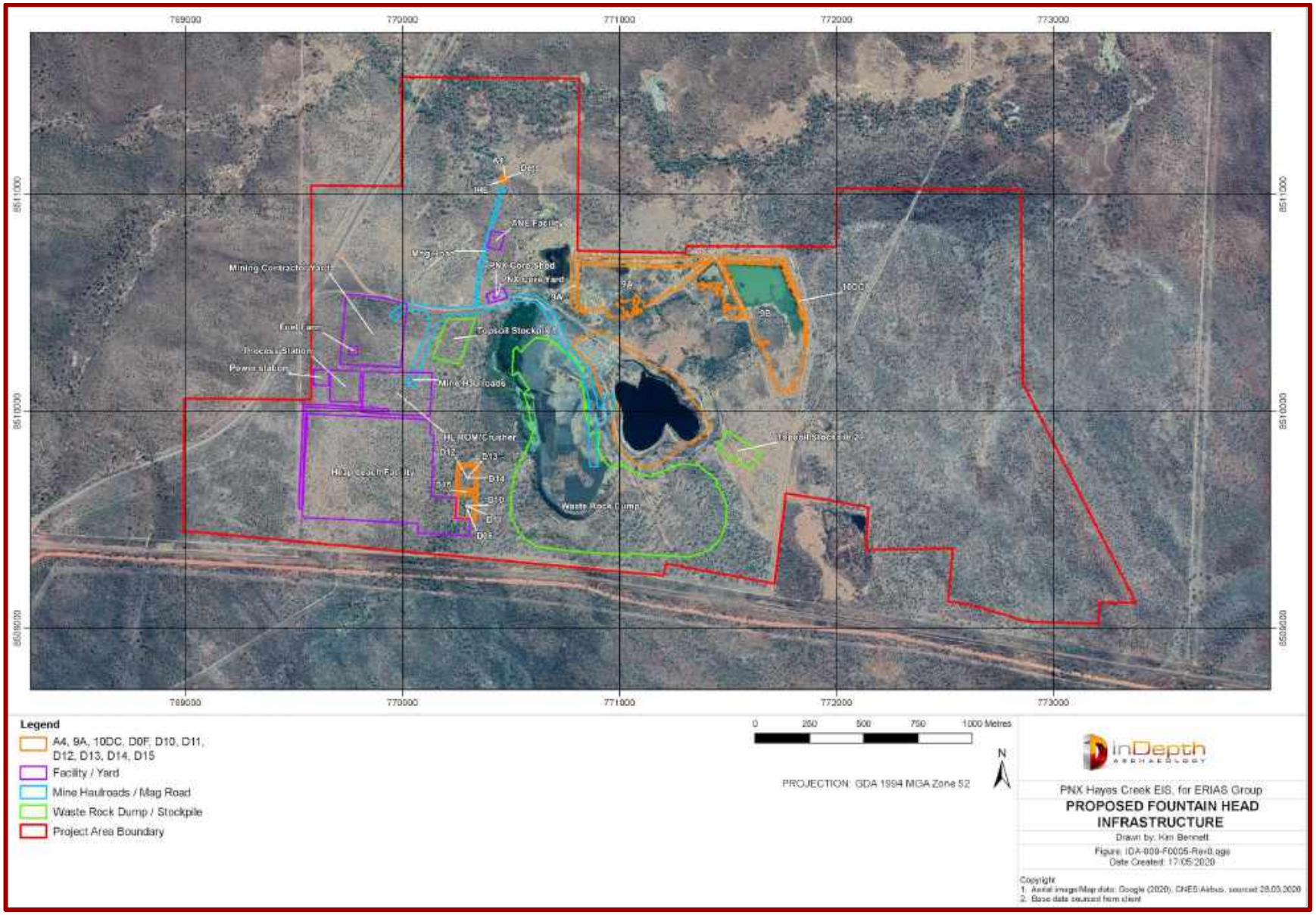

Figure 2: Proposed infrastructure at Fountain Head

2.0 Background

The project area has a long Indigenous history, and almost 150 years of Western occupation. The Warai and Wagiman people are the Traditional Owners of the area, and their traditional association with the land continues to the present day. The archaeology of the Pine Creek Geosyncline area shows that Aboriginal people of the region undertook extensive quarrying and manufacture of stone tools, which were traded over hundreds of kilometres (Martin-Stone 2020:20).

The historical period commenced in the broader Pine Creek region with the explorer John McDouall Stuart who traversed through the area in 1862. Stuart noted that the region might be rich in alluvial gold. This was confirmed in December 1870, when workmen constructing the Overland Telegraph Line (OTL) discovered enough gold to trigger a gold rush to the region (Pearce 1982). Over the subsequent 150 years, the region rode a boom and bust cycle of mining, alongside the development of the pastoral industry and infrastructure such as the North Australian Railway and the Stuart Highway (Martin-Stone 2020:21).

The archaeological assessment of the Fountain Head Project and Haul Road identified a range of archaeological places and objects (see Appendix A for detail). These are categorised as Aboriginal places and objects, historical places and objects, or combined Aboriginal and historical places (see Table 1). This categorisation reflects the different protections afforded to these types of places and objects under the NT *Heritage Act* 2012.

Table 1: Frequency of archaeological features

Feature Type	Fountain Head	Haul Road North	Haul Road South	Total
Aboriginal object	5	3	-	8
Aboriginal place	6	5	2	13
Aboriginal and historical place	-	3	3	6
Historical object	-	1	1	2
Historical place	-	1	4	5
Recent historical place	-	1	-	1
Total:	**11**	**14**	**10**	**35**

There is also the potential for human remains and other unexpected discoveries, however the probability of encountering these cannot be quantified with the information to hand.

Based on the significance assessment of identified archaeological places and objects, In Depth Archaeology mapped the defined significant archaeological resource – significant places and objects, being either Aboriginal places or objects, historical places or objects, or a combined Aboriginal and historical place – within the project footprint (see Figure 3). Maps of the archaeological feature types are located at Figures 4-6, and site data is summarised in Tables 2-6. The management of each type of archaeological feature, with site specific recommendations where warranted, will be outlined in section 4.

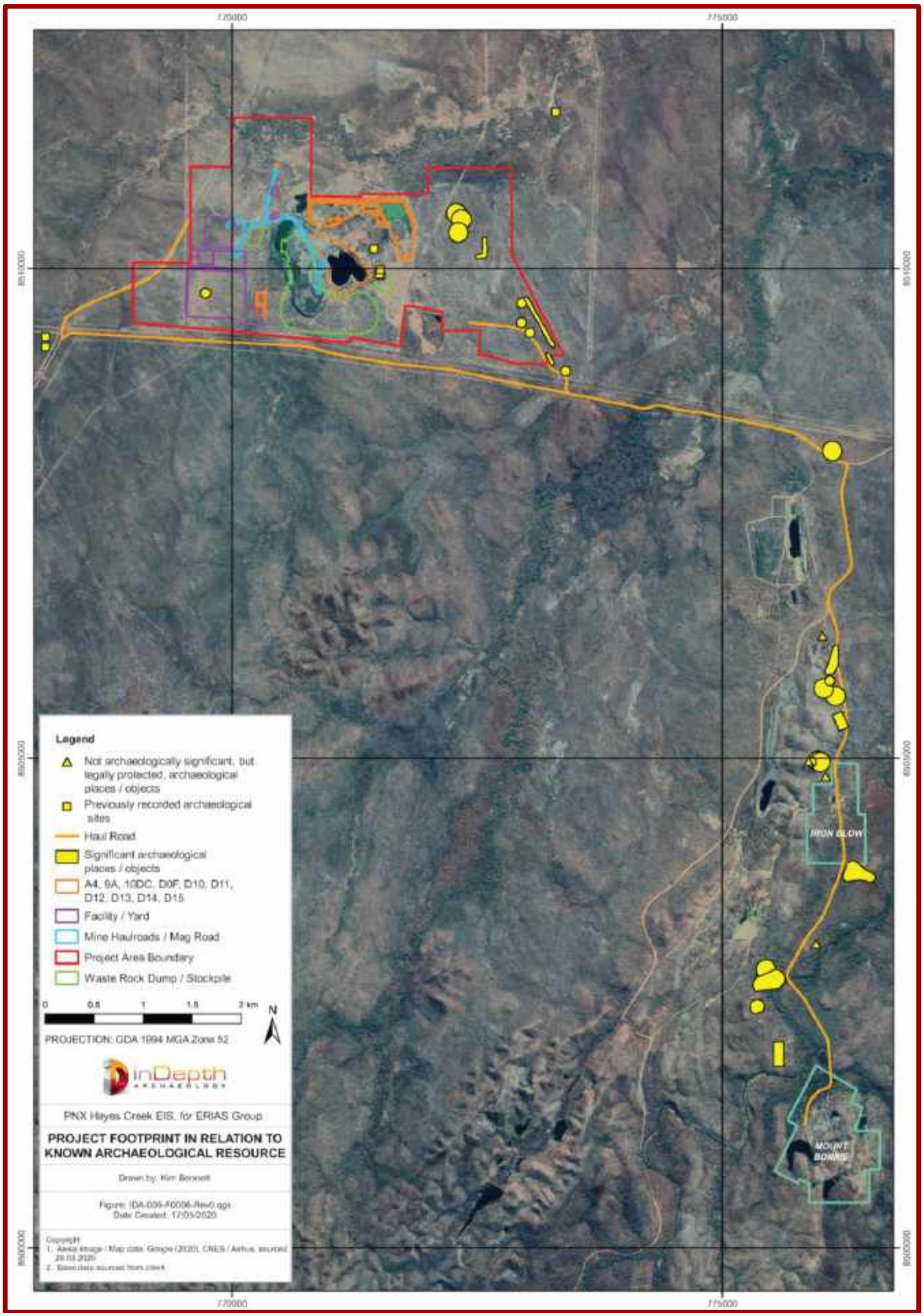

Figure 3: Defined significant archaeological resource in relation to the proposed project footprint

2.1 Fountain Head

The archaeological survey of Fountain Head recorded 6 archaeological places and 5 archaeological objects, as defined under the *Heritage Act*. These Aboriginal places and objects are presumptively protected by the Act. Seven archaeological features were previously recorded by Crassweller in 2006 (see Table 3). These seven sites have not been re-assessed. This should be done before any future works proceed in these areas, if it is expected the ground will be disturbed.

Table 2: Summary of survey results – Fountain Head area

Site Name	Site Type	Easting	Northing
201910220850	Aboriginal object	773401	8508951
201910221030	Aboriginal object	772954	8509645
201910221040	Aboriginal object	772952	8509447
201910221045	Aboriginal object	773040	8509343
201910221220	Aboriginal object	769730	8509747
201910221500	Aboriginal place	772286	8510563
201910221510	Aboriginal place	772339	8510499
201910221515	Aboriginal place	772308	8510368
201910220900	Aboriginal place	773266	8509032
201910220945	Aboriginal place	773275	8509213
21910221545	Aboriginal place	772580	8510129

Table 3: Previously recorded archaeological sites – Fountain Head area (Crassweller 2006)

Site Name	Site description	Site Type	Easting	Northing
HAS4	Fountain Head cattle yards	Historical place	768100	8509300
HAS5	Fountain Head Mine	Historical place	771450	8510200
HAS6	Fountain Head Railway siding	Historical place	768100	8509200
BGPRNE3	Glencoe Head Station	Historical place	773300	8511600
EBPFH BSArch & His2	Artefact Scatter	Aboriginal place	771519	8509928
EBPFH BSArch8	Background Scatter	Aboriginal place	771500	8509940
EBPFH 1	Artefact Scatter	Aboriginal place	771512	8509987

In general, the Aboriginal archaeological sites are concentrated in the eastern portion of the Fountain Head survey area. This is primarily due to the nature of the landscape in this area, comprising low hills with preferred stone resources, in relatively close proximity to the Yam Creek seasonal watercourses.

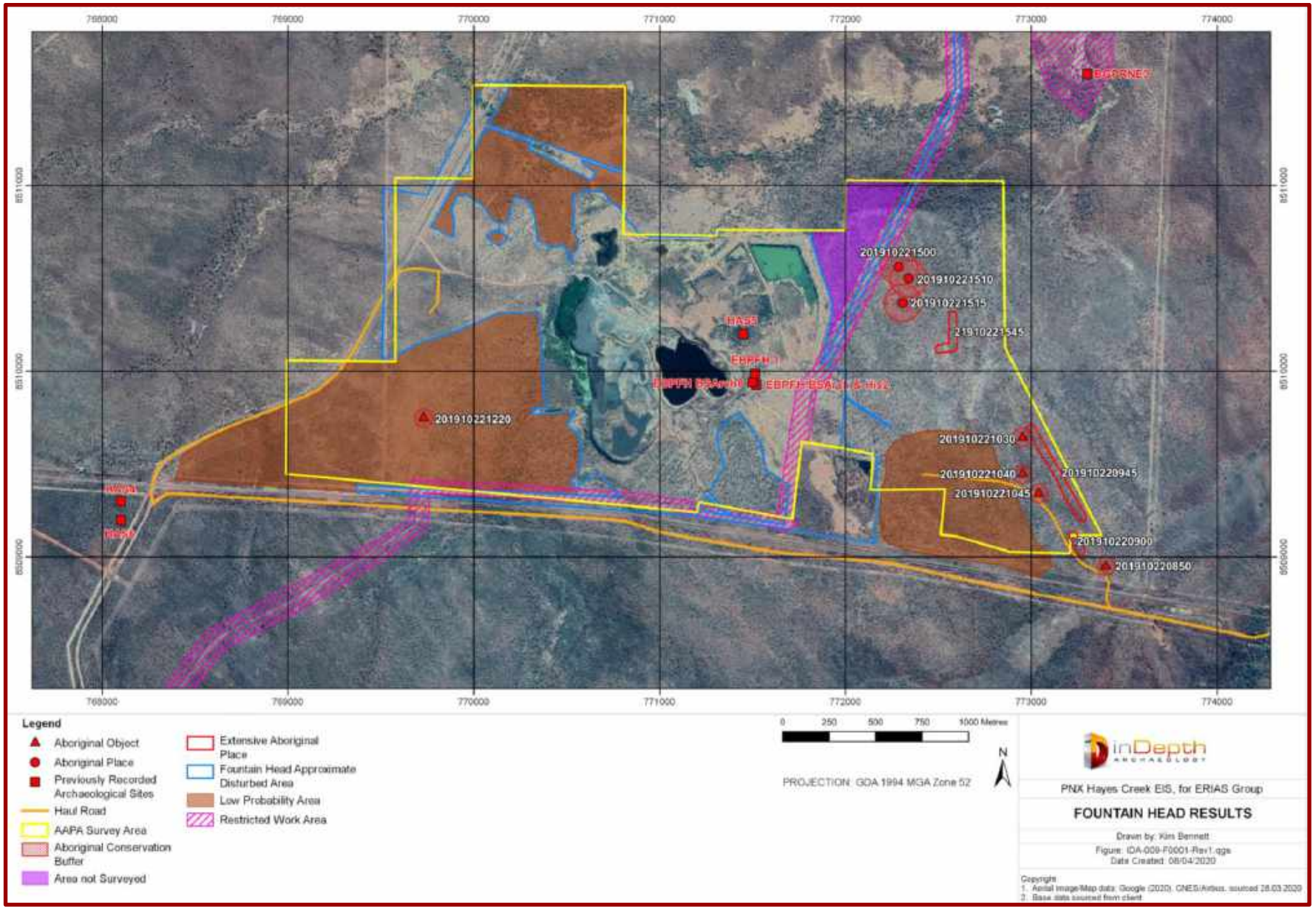

Figure 4: Survey results, Fountain Head area

2.2 Haul road – northern section

The survey team identified 14 archaeological features in the area of haul road planned between Iron Blow and Fountain Head. This included 3 Aboriginal objects, 5 Aboriginal places, 3 combined Aboriginal and historical places, one historical object, one historical place and one recent historical place. The *Heritage Act* presumptively protects the Aboriginal places and objects. None of the historical places or objects are declared heritage places / objects under the Act, and therefore are not legally protected.

These survey results are summarised in Table 4, below, and their locations mapped in Figure 5.

Table 4: Summary of results – northern haul road area

Site Name	Site Type	Easting	Northing
201910231015	Aboriginal object	776098	8505791
201910210830	Aboriginal object	775880	8504955
201910210840	Aboriginal object	775906	8504959
201910230953	Aboriginal place	776154	8505635
201910231010	Aboriginal place	776034	8505714
201910231020	Aboriginal place	776074	8505881
201910210845	Aboriginal place	775975	8504971
201910210900	Aboriginal place	775999	8504962
201910211450	Aboriginal place and historical place	776237	8505308
201910210945	Aboriginal place and historical place	776054	8504798
201910211210	Aboriginal place and historical place	776122	8508136
201910210905	Historical Object	776010	8504969
201910191130	Historical place	776130	8506638
201910211235	Recent historical place	776022	8506232

In general, the sites in this area reflect similar priorities for both Indigenous and Western occupation periods – resource extraction, plus associated evidence of the lives of people who lived and worked in the area. A series of sites on the low hills between the ridgeline and the haul road are quarry and reduction sites of varying density. These Aboriginal places and objects provide evidence for the extraction and working of raw materials for a variety of tool types. A cluster of sites in the northwest corner of the Iron Blow area includes historical and Aboriginal places and objects. The Aboriginal stone artefacts include bipolar percussed blades – a relatively uncommon manufacturing technique used to maximize the use of the resource.

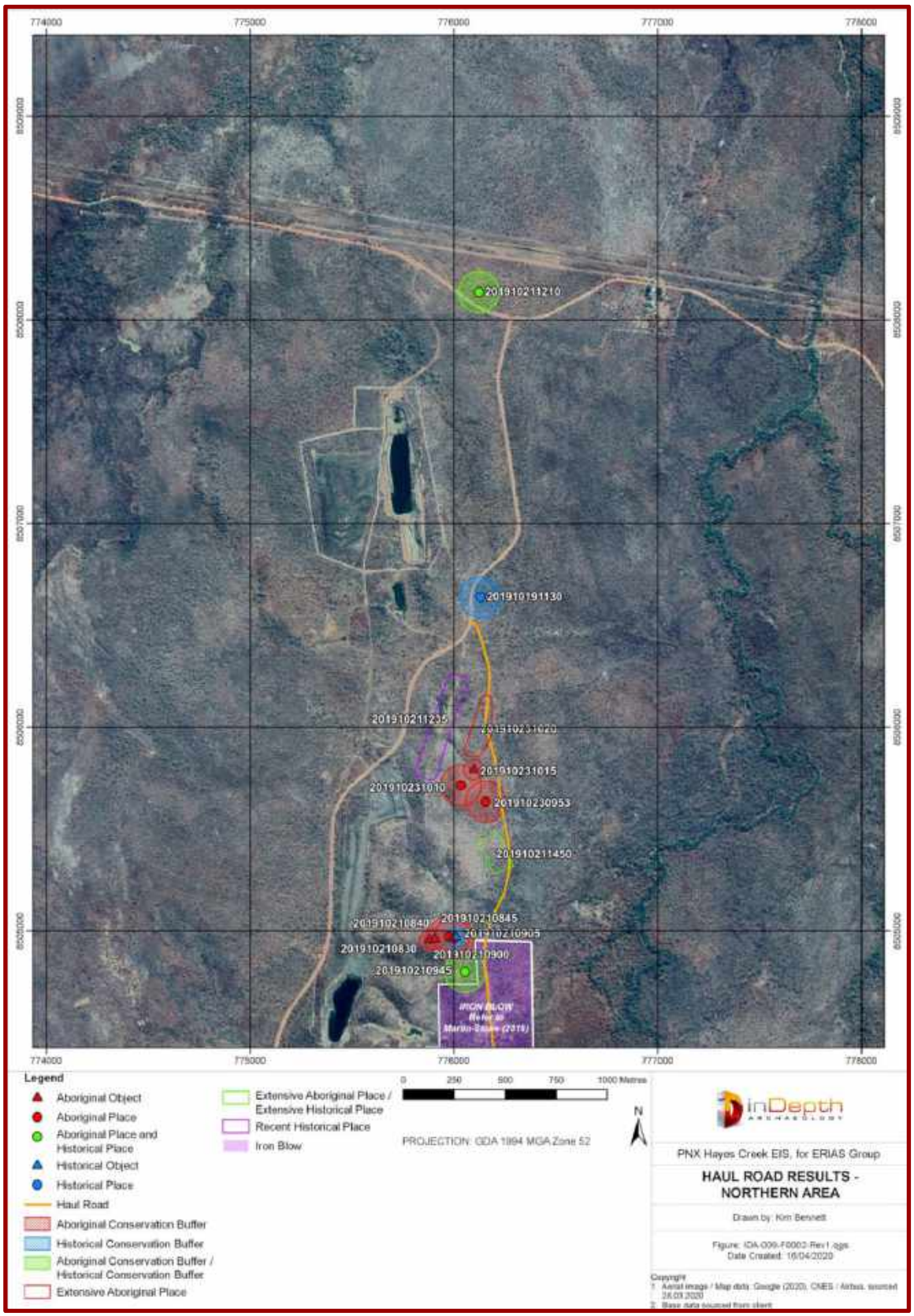

Figure 5: Survey results, northern haul road area

2.3 Haul road – southern section

The survey area south of Iron Blow includes the original location of the Grove Hill settlement, and the Port Darwin Camp Cemetery and associated sites. It also includes extensive evidence of Aboriginal occupation of the area, prior to Western arrival. The evidence from the Grove Hill settlement site shows Indigenous people using Western materials during the 'contact period,' knapping glass in the manner of their stone tool manufacture.

The survey team identified 10 archaeological features in this part of the project area. These features included 2 Aboriginal places, 4 historical places, 3 combined Aboriginal and historic places, and one isolated historical object. The *Heritage Act* presumptively protects the Aboriginal places and objects. None of the historical places or objects are declared heritage places / objects under the Act, and therefore are not legally protected. However, in most cases their significance according to the criteria of the Act warrants their preservation (see Appendix A).

These survey results are summarised in Table 5, below, and their locations mapped in Figure 6.

Table 5: Summary of results - southern haul road area

Site Name	Site Type	Easting	Northing
201910191340	Aboriginal place	775575	8501928
201910200820	Aboriginal place	775313	8502488
201910201005	Aboriginal place and historical place	775956	8503088
201910201115	Aboriginal place and Historical place	776508	8503784
201910191515	Aboriginal place and historical place	775538	8502746
201910201015	Historical Object	775956	8503171
GRAVE	Historical place	775446	8502813
SIGNAGE	Historical place	775447	8502843
201910200845	Historical place	775422	8502569
201910200945	Historical place	775802	8503082

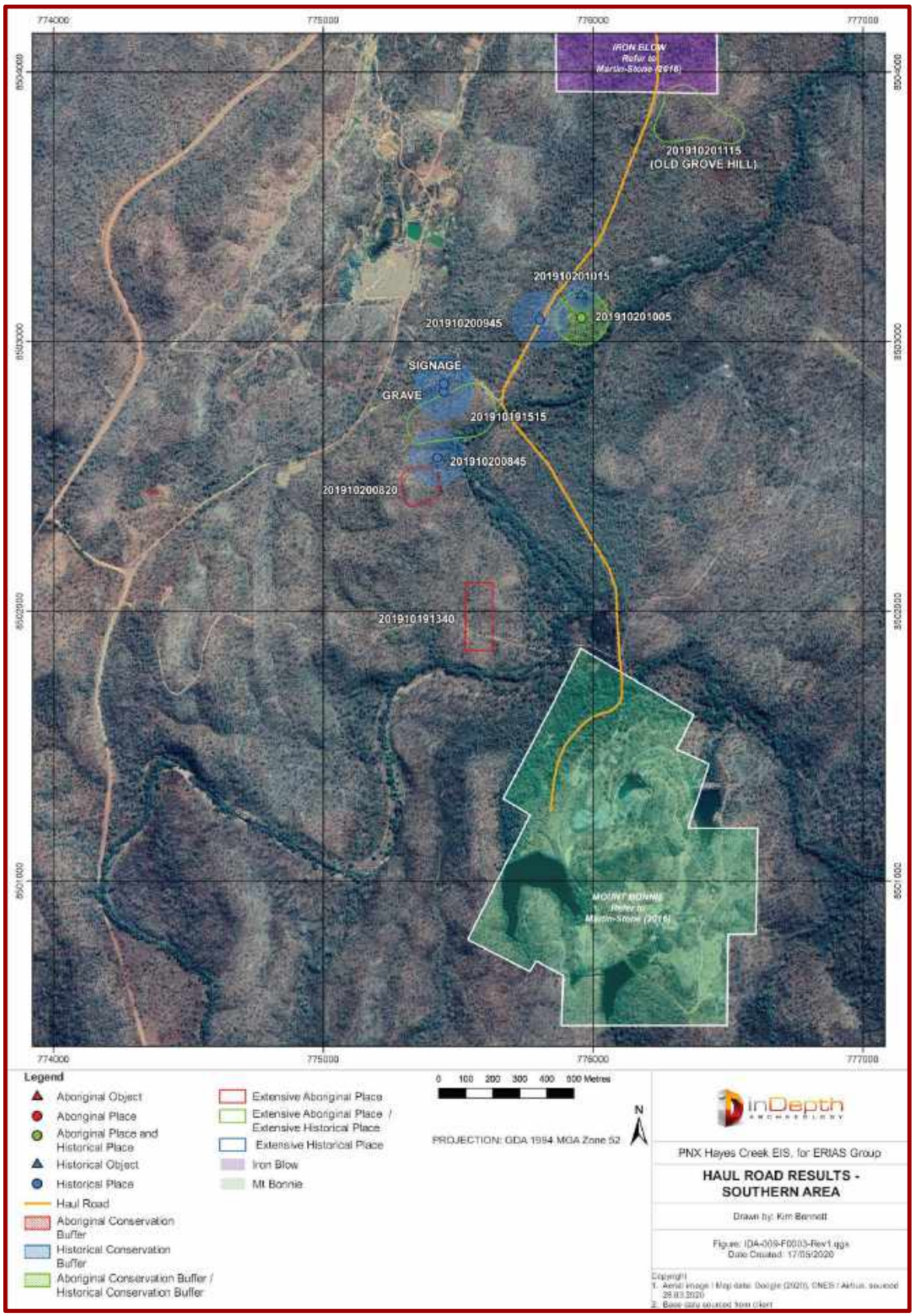

Figure 6: survey results, southern haul road area

3.0 Legislative Context and Statutory Requirements

Both Commonwealth and Northern Territory Acts apply in particular circumstances within the Northern Territory. These Acts include the Commonwealth's *Aboriginal Land Rights (Northern Territory) Act* 1976 (ALRA); *Native Title Act* 1993; *Aboriginal and Torres Strait Islander Heritage Protection Act* 1984, and *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC); and the Northern Territory's *Heritage Act* 2012, and *Northern Territory Aboriginal Sacred Sites Act* 1989.

As the project area does not comprise of Aboriginal land under either ALRA or Native Title, these Commonwealth Acts do not apply. The *Aboriginal and Torres Strait Islander Heritage Protection Act* is an Act of 'last resort,' used to provide emergency protection when all other avenues have been exhausted. This Act is unlikely to apply in this area.

The CHMP is developed as part of the environmental impact assessment process governed by the EPBC Act, which provides a legal framework to manage significant natural and cultural heritage places. The EPBC Act creates the National Heritage List and the Commonwealth Heritage List. No archaeological places or objects in the project area are listed on either of these registers.

The Northern Territory legislation is the most applicable in the project area, for the appropriate management of cultural heritage.

3.1 Northern Territory Acts

The NT Aboriginal Sacred Sites Act 1989 protects sites that are 'sacred and otherwise of significance in the Aboriginal Tradition'. Sacred Sites are protected whether the location of the sites are known or not by any person or company seeking to do work on lands. The Aboriginal Areas Protection Authority (AAPA) administers the Act. The AAPA can issue a Certificate indemnifying a proponent for an area upon application and payment of a fee. The Certificate may contain conditions limiting or preventing works in and around registered and recorded Sacred Sites. The Authority Certificate will contain maps outlining any restricted work areas in the area of application.

The NT Heritage Act (2012) establishes the Heritage Council and the Heritage Register, protects significant heritage places and objects, and sets penalties for offences against the Act. The Heritage Act provides automatic protection for Aboriginal and Macassan archaeological places and objects, which are automatically declared heritage places and objects. The Act also sets the process by which other significant places or objects may be added to the Heritage Register, and afforded protection under the Act. The Act allows for processes to approve works, research and maintenance on a declared heritage place or object. There are penalties for accidental or deliberate destruction, amongst other offences.

3.2 Commonwealth Acts

***Aboriginal and Torres Strait Islander Heritage Protection Act* 1984:** This Act is a site protection Act of 'last resort', meaning that the Act is meant to provide emergency protection for Aboriginal and Torres Strait Islander heritage sites when all other avenues have been exhausted. Generally an Indigenous group must apply to the Minister to have protective covenants placed over an area or site. The power to provide such protection resides in Section 51 of the Constitution giving the Commonwealth powers on Aboriginal issues. Therefore this Act may override all State and Territory

cultural heritage acts where there are conflicting provisions. This Act may apply to the proposed development only if it is invoked by the Federal Minister.

4.0 Heritage Management

At all times, mitigation measures are driven by the basic conservation philosophy:

Do as much as necessary, but as little as possible.

These mitigation measures can range from awareness and avoidance, further non-invasive research, archaeological monitoring, and/or archaeological salvage excavation. This ensures that, wherever possible, heritage materials are conserved in situ, retaining their context, which is an integral part of their heritage significance. If disturbance is authorised, mitigation measures ensure context is recorded and understood, and collections of artefacts are managed appropriately.

Awareness and avoidance:
The rationale for avoidance is to prevent any disturbance of in situ archaeological materials. This mitigation measure should include cultural heritage induction for all on site personnel, and signage and barrier fencing (including temporary barrier fencing) where warranted, to enforce the recommended conservation buffers during the course of works.

The archaeological assessment (Appendix A) recommends avoidance of all recorded significant cultural heritage places and objects, through communicating to on site personnel the existence of a conservation buffer. This buffer is determined individually for each archaeological feature, either within a radius of defined GPS co-ordinates or within a boundary mapped in the assessment report. See Table 6 for site-specific recommendations.

Further definition of the archaeological resource, where required:
The rationale for defining the boundaries of places is to ensure that full knowledge of the archaeological resource is available, so that management decisions can be tailored to the needs of each particular site.

Some archaeological places could not be fully documented due to limitations of the field survey, including lack of visibility and time constraints. Further documentation of these places is recommended if the proponent is planning to undertake works within the recommended conservation buffer. For site-specific recommendations, see Table 6.

Archaeological monitoring:
The rationale for archaeological monitoring is to ensure works do not encroach on archaeological materials, and/or to appropriately identify and salvage artefacts encountered during the course of works, if the probability of encountering archaeological materials is deemed sufficient to warrant monitoring. Monitoring should be undertaken by qualified professional/s.

While avoidance is the primary recommendation for all recorded significant heritage places and objects in the project area, the consultant has identified some places and objects that may be disturbed (salvaged) with appropriate consultation with Traditional Owners and authorisation under the *Heritage Act.* (See Table 6.)

Archaeological salvage excavation:
The rationale for salvage excavation is to 'rescue' archaeological materials that would otherwise be destroyed by the development. This must be undertaken by qualified professional/s with all relevant statutory approvals, in consultation with Traditional Owners and other stakeholders.

While avoidance is the primary recommendation for all recorded significant heritage places and objects in the project area, the consultant has identified some places and objects that may be disturbed (salvaged) with appropriate consultation with Traditional Owners and authorisation under the *Heritage Act.* (See Table 6.)

4.1 Site specific recommendations

The archaeological assessment identified a range of archaeological places and objects in the project area. The recommendations for each place or object were developed in line with its significance (see Table 6). Sections 4.2 – 4.6 outline how to manage each type of archaeological feature, in line with the recommendations of the report, to mitigate the impact on the heritage resource.

Table 6: Site-specific project impact and management recommendations

Site Name	Site Type	Easting	Northing	Project impact	Management recommendation
FOUNTAIN HEAD AREA					
201910220850	Aboriginal object	773401	8508951	The haul road alignment passes within the proposed buffer zone.	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221030	Aboriginal object	772954	8509645	Not affected	Impose a 50m conservation buffer zone.
201910221040	Aboriginal object	772952	8509447	Not affected	Impose a 50m conservation buffer zone.
201910221045	Aboriginal object	773040	8509343	The haul road alignment passes within the proposed buffer zone.	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221220	Aboriginal object	769730	8509747	Located in the area of the proposed heap leach facility	May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221500	Aboriginal place	772286	8510563	Not affected	Impose a 100m conservation buffer zone.
201910221510	Aboriginal place	772339	8510499	Not affected	Impose a 100m conservation buffer zone.
201910221515	Aboriginal place	772308	8510368	Not affected	Impose a 100m conservation buffer zone.
201910220900	Aboriginal place	773266	8509032	Not affected, though haul road alignment passes alongside the buffer zone.	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If the conservation buffer cannot be protected by flagging or temporary fencing during the course of works, archaeological monitoring may be required.
201910220945	Aboriginal place	773275	8509213	Not affected	Impose a conservation buffer zone according to the mapped boundaries.
21910221545	Aboriginal place	772580	8510129	Not affected	Impose a conservation buffer zone according to the mapped boundaries.
FOUNTAIN HEAD AREA - PREVIOUSLY SURVEYED SITES					
EBPFH BSArch & His2	Aboriginal place	771519	8509928	Likely to be affected	This site could not be surveyed in the 2019 survey. If it is intended to proceed with works in this area, the site's condition should be documented and appropriate management recommendations made based on its current condition.
EBPFH BSArch8	Aboriginal	771500	8509940	Likely to be affected	This site could not be surveyed in the 2019 survey. If it is intended to

	place				proceed with works in this area, the site's condition should be documented and appropriate management recommendations made based on its current condition.
EBPFH 1	Aboriginal place	771512	8509987	Likely to be affected	This site could not be surveyed in the 2019 survey. If it is intended to proceed with works in this area, the site's condition should be documented and appropriate management recommendations made based on its current condition.
HAS5	Historical place	771450	8510200	Likely to be affected	This site could not be surveyed in the 2019 survey. If it is intended to proceed with works in this area, the site's condition should be documented and appropriate management recommendations made based on its current condition.
Site Name	**Site Type**	**Easting**	**Northing**	**Project Impact**	**Management recommendation**
HAUL ROAD NORTH AREA					
201910231015	Aboriginal object	776098	8505791	Not affected	Impose a 50m conservation buffer zone.
201910210830	Aboriginal object	775880	8504955	Not affected	Impose a 50m conservation buffer zone.
201910210840	Aboriginal object	775906	8504959	Not affected	Impose a 50m conservation buffer zone.
201910230953	Aboriginal place	776154	8505635	The haul road alignment passes within the proposed buffer zone. The widening of the road in a westerly direction from the existing track is likely to impact on this site, if the haul road alignment cannot be moved.	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If the site must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910231010	Aboriginal place	776034	8505714	Not affected	Impose a 100m conservation buffer zone. Recommended to be left undisturbed.
201910231020	Aboriginal place	776074	8505881	The haul road alignment passes within the proposed buffer zone.	Impose a conservation buffer zone according to the mapped boundary. Conduct more detailed survey prior to any works in the area, to better define the extent of the site. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210845	Aboriginal place	775975	8504971	Not affected	Impose a 100m conservation buffer zone.
201910210900	Aboriginal place	775999	8504962	Not affected	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and

					with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910211450	Aboriginal place and historical place	776237	8505308	The haul road alignment passes within the proposed buffer zone.	Impose a conservation buffer zone according to the mapped boundary. Conduct more detailed survey prior to any works in the area, to better define the extent of the site, relative to the planned widening of the road. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210945	Aboriginal place and historical place	776054	8504798	Not affected	Not considered significant due to poor site condition. Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910211210	Aboriginal place and historical place	776122	8508136	The existing road passes within the proposed buffer zone.	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If the road must be widened in an uphill direction, archaeological salvage of the affected area will be required. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210905	Historical Object	776010	8504969	Not affected	Object is not legally protected or significant.
201910191130	Historical place	776130	8506638	May be affected by road widening works	Site is not legally protected or significant. Works may proceed in this area.
201910211235	Recent historical place	776022	8506232	Not affected	Site is not legally protected or significant, aside from single Aboriginal stone artefact identified. Works may proceed in this area if necessary, with permit to disturb isolated artefact.
Site Name	**Site Type**	**Easting**	**Northing**	**Project Impact**	**Management recommendation**
HAUL ROAD SOUTH AREA					
201910191340	Aboriginal place	775575	8501928	Not affected	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed.
201910200820	Aboriginal place	775313	8502488	Not affected	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed.
201910201005	Aboriginal place and historical place	775956	8503088	Not affected	Not significant due to poor site condition. Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910201115	Aboriginal place and	776508	8503784	Not affected	Old Grove Hill – highly significant. Impose a conservation buffer zone according to the mapped boundary. Recommended to be left

	Historical place				undisturbed, and undertake further archaeological investigation if possible.
201910191515	Aboriginal place and historical place	775538	8502746	Works at the river crossing and widening of the haul road are adjacent to the boundaries of this site	Highly significant. Impose a conservation buffer zone according to the mapped boundary – will require a visual barrier such as flagging or temporary fencing during works. Recommended to be left undisturbed, and undertake further archaeological investigation of the westernmost hill in conditions of better visibility, to properly document the site boundary.
201910201015	Historical Object	775956	8503171	Not affected	Object is not legally protected or significant.
GRAVE	Historical place	775446	8502813	Not affected	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If any works to the west of the haul road alignment are planned in future, geophysical investigation to define the boundaries of the cemetery, and further historical and archaeological research, would be necessary to develop appropriate management measures for the cemetery.
SIGNAGE	Historical place	775447	8502843	Not affected	Recommended to be left undisturbed. While not technically part of the historical fabric of the cemetery, this signage represents community efforts to recognise and interpret heritage places in remote areas. If it is necessary to disturb the signage, it should be replaced with updated equivalent interpretive materials.
201910200845	Historical place	775422	8502569	Not affected	Site is not legally protected or significant.
201910200945	Historical place	775802	8503082	Existing track and proposed haul road go through the centre of this place.	Site is not legally protected or significant. Works may proceed in this area.

4.2 Sacred Sites

Sacred Sites are protected whether the location of the sites are known or not by any person or company seeking to do work on lands. The Aboriginal Areas Protection Authority (AAPA) administers the Act. It is recommended that the proponent liaise with the AAPA to maintain currency of all necessary authorisation certificates for the project area.

4.3 Aboriginal Places and Objects

Probability

Table 6 documents the known Aboriginal places and objects in the project area. There is a moderate to high probability of finding further Aboriginal artefacts in some parts of the project area. Where required, archaeological monitoring or further survey in conditions of better visibility has been recommended in Table 6, to better define the extent of Aboriginal places.

Recognition

It is often difficult for the untrained eye to identify stone artefacts, which are the most common surviving material in the local archaeological record. Materials such as shell and animal bone also require close assessment to identify whether they have been modified by humans (and are therefore protected under the *Heritage Act*) or whether they occur naturally in the landscape. For these reasons, it is important for qualified personnel to conduct archaeological monitoring and salvage in areas where there is a higher probability of encountering Aboriginal places and objects.

Protection

Aboriginal and Macassan archaeological places and objects are protected under Part 2.1 of the *Heritage Act.*

Management

It is recommended that all works avoid any disturbance of known Aboriginal places and objects. See Table 6 for site-specific conservation buffers.

If works are planned within the defined conservation buffers, the proponent should liaise with the consultant archaeologist on a case-by-case basis to determine whether archaeological monitoring or salvage may be required. The consultant will manage the approvals and salvage process, if it is required. It is recommended to include Traditional Owner representatives in all monitoring and salvage works, and that consultation and planning regarding the management of potentially salvaged artefacts be completed prior to obtaining authorisation under the Act.

At the completion of each phase of archaeological monitoring or salvage, the project archaeologist should complete a report for the proponent, Heritage Branch and Traditional Owners.

4.4 Significant Historical Places and Objects

Probability

Table 6 documents the known historical places in the project area. There is a low probability of finding further significant historical places, however the possibility cannot be ruled out.

Recognition

It is difficult for the untrained observer to easily recognise the significance of historical materials, particularly if the remains are fragmentary. It is therefore recommended that the advice of qualified professionals be sought if potentially significant historical places are encountered during the course of works.

Protection

The significant historical places and objects in the project area are not registered for protection under the *Heritage Act.* It is possible that anyone may nominate these places / objects for assessment and potential declaration as heritage places / objects, at any time. The probability of anybody doing so has not been assessed. Proactive mitigation of potential impacts on significant historical materials is recommended, due to their demonstrated significance.

Where historical and Aboriginal places co-occur in the same location, the place is protected under Part 2.1 of the Act.

Management

Table 6 contains site-specific recommendations for historical places and objects.

As undeclared historical materials are currently not protected by the *Heritage Act*, there is no requirement for statutory approvals. However, it is recommended that any monitoring and salvage works are done in communication with Heritage Branch.

At the completion of each phase of archaeological monitoring or salvage, a report should be prepared by the project archaeologist for the proponent, Heritage Branch and Traditional Owners, if necessary.

4.5 Human Remains

Probability

The Port Darwin Camp cemetery is documented within the project area shown in Figure 1, and is known to contain more decedents than are visibly marked. Researchers, to date, have not identified the locations of the historical cemeteries of the Yam Creek and Fountain Head communities. According to Jones (1984:62), “At one stage Fountainhead had a sizeable township with over 1000 Chinese, but by the end of 1880 only about fifty remained, mainly sick people or those with good claims.” The Yam Creek and Fountain Head cemeteries are documented in historical records, but not located on the ground. Yam Creek is between Fountain Head and Iron Blow. As such, there is a

possibility that human remains from the historical period may be inadvertently encountered in the project area. Due to a lack of knowledge of local burial locations of Indigenous people over millennia, there is also a possibility that Indigenous human remains may be encountered.

Recognition

The general location of the Port Darwin Camp cemetery is recognisable due to the presence of a single headstone, however the extent and boundaries of this cemetery are not known, and are not visible on the surface.

Many elements of the human skeleton are readily recognisable. However, disturbance and natural decay may make it difficult to readily identify bone (including fragments) as human, and some smaller elements are not readily identifiable to the untrained eye. Any unidentifiable bone should be treated as potentially human until such time as it is verified as human or fauna. For verification, call the project archaeologist or relevant specialist.

Protection

Aboriginal human remains are protected under the terms of the *Heritage Act*, and it is an offence to interfere with the remains of a deceased person under the Northern Territory Criminal Code.

Management

If human remains are encountered during works, the following procedures should be followed.

1. Stop works immediately, and notify the site supervisor. Ensure that all staff present are aware of their obligation to maintain confidentiality.
2. The site supervisor will immediately report the presence of human remains to the project manager.
3. The project manager will contact the project archaeologist, and the Director of the Heritage Branch on 08 8999 5039 to report the find. If the Director is not available, the project manager will contact the Officer in Charge of the nearest local Police Station.
4. All actions from that point onwards will be undertaken under the instruction of the Heritage Branch and/or the NT Police, in accordance with the relevant Human Remains Protocol which is a tripartite agreement between Heritage Branch, NT Police and the Aboriginal Areas Protection Authority (Appendix C).
5. It is recommended that all management of human remains be conducted in accordance with the standards set out in the World Archaeological Congress' Vermillion Accord on Human Remains (Appendix D) and the UN Protocol for the Disinterment and Analysis of Human Remains (Appendix E).

4.6 Other unexpected discoveries

There is always the potential for other unexpected discoveries during ground disturbance works. If contractors or staff locate any materials of unknown heritage significance, they are advised to contact the project archaeologist, and/or the Director of NT Heritage Branch on 08 8999 5039 for further advice.

5.0 Compliance

5.1 Penalties for offences:

Chapter 5 of the *Heritage Act* details its enforcement, including the rights of heritage officers to enter a place, inspect a place, require information from people and to seize items. Under S104, S105, S106, S109 & S110 a person commits an offence if the person engages in conduct that results in a contravention of the heritage officer's requirements or actions **(maximum penalty = 100 units, or $15,500)**. A heritage officer may use help or reasonable force in exercising their powers.

Under S111, S112 & S113 of the *Heritage Act*, it is an offence to cause damage to, or remove a part of, a heritage place or object **(maximum penalty = 400 units or $62,000; or imprisonment for 2 years**).

It is an offence under S114 to fail to report the discovery of an archaeological place or object **(maximum penalty = 20 units or $3,100)**.

It is an offence under S116 to provide misleading information or documents **(maximum penalty = 200 penalty units or $31,000; or imprisonment for 12 months).**

Under S117, it is an offence to obstruct a heritage officer acting in an official capacity **(maximum penalty = 200 penalty units or $31,000; or imprisonment for 12 months)**.

Under S118, it is an offence to falsely represent oneself as a heritage officer **(maximum penalty = 200 units or $31,000; or imprisonment for 2 years)**.

S121 covers the criminal liability of an executive officer of a body corporate for offences under the Act. **The maximum penalty that may be imposed is the same penalty as may apply to an individual for the relevant offence.** In deciding whether the executive officer took reasonable steps to prevent the contravention of the Act, the court will consider any action the executive officer took towards ensuring:

- regular professional assessments of the company's compliance with the Act,
- implementation of any appropriate recommendations from the above assessments, and
- the company's representatives and contractors having a reasonable knowledge and understanding of the requirement to comply with the terms of the *Heritage Act.*

The court must also consider any action the executive officer took when they became aware that a contravention was, or could be, about to happen.

The NT *Criminal Code* provides for the additional protection of human remains. Under S140, any person who performs an act of misconduct with regard to human remains is guilty of an offence and is **liable to imprisonment for 2 years**.

5.2 Roles and responsibilities:

An executive officer employed by the proponent is responsible under S121 of the Heritage Act for ensuring regular professional assessments of the company's compliance with the Act, and the implementation of any appropriate recommendations from these assessments.

The proponent is responsible for engaging the services of a qualified archaeologist for any assessment, survey, monitoring or salvage excavation of future works not reviewed to date.

The proponent is responsible for ensuring that Traditional Owners are included and consulted at all appropriate stages of cultural heritage management action.

The proponent is also responsible for ensuring that all company's representatives and contractors have a reasonable knowledge and understanding of their legal obligations. This can be achieved by implementing appropriate induction procedures for all staff and contractors upon commencement.

6.0 Other Issues

6.1 Deterrence of metal detectorists, fossickers and other people who may cause disturbance

During the archaeological survey, the team encountered a metal detectorist, and also observed fresh and other recent disturbance of Aboriginal and historical places and objects. Metal detectorists or fossickers most likely inflicted this damage while scavenging for historical artefacts or mineral finds. These activities cause irreparable damage to archaeological places and objects, whether they are Aboriginal, historical, or a combination of both.

Activities such as this are difficult to police, given the remoteness and sparse population in the area. In Depth Archaeology recommends a proactive response to this issue, by erecting signs prohibiting unauthorised access, with particular mention of the potential for damage to legally protected heritage places. Penalties include fines of up to $62,000, imprisonment for up to two years, or both.

Due to the fact that historical and Aboriginal sites frequently co-occur, and that Aboriginal sites are not necessarily readily identifiable to the untrained eye, the risk of unauthorised people destroying protected heritage places (even partially or inadvertently) is assessed as high.

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Appendices:

Appendix A – Martin-Stone, KC 2020. An archaeological assessment of PNX Metals' Fountain Head Gold Project. Unpublished report to ERIAS Group.

Appendix B – Martin-Stone, KC 2016. A report on the archaeological survey of PNX Metals' NT exploration leases, 2016. Unpublished report to PNX Metals.

Appendix C – Heritage Branch / AAPA / NT Police human skeletal remains protocol

Appendix E – The Vermillion Accord on Human Remains

Appendix F – The UN Protocol for the Disinterment and Analysis of Human Remains

An archaeological assessment of PNX Metals' Fountain Head Gold Project

A report to ERIAS Group

by Karen Martin-Stone
18 May 2020

A report on the archaeological assessment of PNX Metals' Fountain Head Gold project

Prepared by: *Karen Martin-Stone*

Version notes:

Version	Author	Date	Changes
V1.0	Karen Martin-Stone	16/04/2020	First draft
V1.1	Karen Martin-Stone	18 May 2020	Amendments including more detailed results and additional figures

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Glossary

Aboriginal place	An Aboriginal place is an archaeological place that relates to the past human occupation of the Territory by Aboriginal people, and has been modified by the activity of those people (NT *Heritage Act,* S6(2)).
Aboriginal object	An Aboriginal object is a relic that relates to the past human occupation of the Territory by Aboriginal people, and is in an Aboriginal place, or stored in a place in accordance with Aboriginal tradition, for example, in an Aboriginal keeping place. (NT *Heritage Act,* S8(2)).
Archaeological place	An archaeological place is a place that relates to the past human occupation of the Territory, and has been modified by the activity of the occupiers. (NT *Heritage Act,* S6(1))
Archaeological object	An archaeological object is a relic that relates to the past human occupation of the Territory, and is in an archaeological place (NT *Heritage Act,* S8(1)). Archaeologists generally take a broader view, that an archaeological object is any object modified by humans. It may be recorded isolated from other artefacts or in an archaeological place.
Artefact	Any object modified by humans. The broadest assessment defines all material objects as either 'cultural' (modified by humans, and therefore an artefact of human culture), or 'natural' (not modified by humans).
Blank	See pre-form
BP	[Years] Before Present, where 'present' is defined as 1950
Colonial	Relating to a colony / the colonies. The Northern Territory was never a colony. It was a Territory annexed to South Australia by letters patent in 1863, and transferred to the Commonwealth of Australia in 1911 as a result of Acts passed in the South Australian and Federal parliaments.
Combined Aboriginal and historical place / object	An archaeological place that contains both Aboriginal and historical artefacts / material culture. The Aboriginal artefacts may be related to either the historical or Aboriginal occupation periods, or both.
Conchoidal	A type of fracture in a solid (such as stone), which results in a smooth rounded surface resembling the shape of a scallop shell.
Grid reference datum	This report uses GDA94 as the grid co-ordinate datum.
Heritage object	An object declared under Part 2.1 or 2.2 to be a heritage object, or a place of a protected class of heritage objects. (NT *Heritage Act*, S4). Part 2.1 declares all Aboriginal or Macassan archaeological objects as

	heritage objects (NT *Heritage Act,* S18).
Heritage place	A place declared under Part 2.1 or 2.2 to be a heritage place, or a place of a protected class of heritage place. (NT *Heritage Act*, S4). Part 2.1 declares all Aboriginal or Macassan archaeological places as heritage places (NT *Heritage Act,* S17).
Historical	Relating to a period in the past that can be studied by using contemporary written documents. 'History' is literally 'written history,' and therefore the historical period commences in a given geographic location when writing is developed or introduced. History continues up to the present.
Historical place	A historical place is a place that contains artefacts / material culture related to the historical period. It is important to note that a historical place is not afforded protection under the NT *Heritage Act* unless it has been declared a heritage place by the Minister. Aboriginal artefacts from the historical period in a combined historical and Aboriginal place are protected under the Act.
Historical object	A historical object is an artefact related to the non-Aboriginal and non-Macassan occupation of the Northern Territory. It is important to note that a historical object is not afforded protection under the NT *Heritage Act* unless the Minister has declared it a heritage object.
Human remains	Most commonly understood to be skeletal remains (skull and/or post-cranial bones), but may also include preserved soft tissue or cremains (cremated remains)
Intangible heritage	Cultural expressions that do not have a material form, for example, music, language, stories, dance, cultural practices / mores / rites / rituals
Isotropic	Having a physical property that has the same value when measured in different directions. Isotropic stone has uniform density and hardness across all planes, allowing force to travel through without impediment. This predictability allows for the application of controlled force to achieve a planned result, for example, the manufacture of stone tools.
Knapping	The manufacturing of stone tools, and occasionally glass tools
Material culture	See artefact. Material culture is a tangible thing created by humans.
MGA	This report uses Map Grid Australia as the UTM grid reference system.
Occupation	Human settlement in a geographical location
Pre-form	Otherwise known as a blank. An artefact in early stage of manufacture, for example, an axe blank or a blade pre-form. The stone has been

	removed from the quarry and shaped, but not yet refined to final form.
Relic	This term is not generally used by archaeologists, and is not used in this report. It is defined in the NT *Heritage Act* as an artefact or thing given shape by a person, or human or animal skeletal remains, or something else prescribed by regulation (S9(1)). It is included here to provide clarity around the definitions of Aboriginal, historical and archaeological objects above. However, S9(3) and S9(4) of the Act introduce confusion, by stating that a relic made for sale is not a relic, and a thing prescribed by regulation is not a relic (directly contravening S9(1)). It is also ethically indefensible to define human skeletal remains as a relic or archaeological object. There is an ongoing review of the Act, which may result in better definitions and legislative protections for artefacts and human remains.
Use wear	Damage or residue on the surface or working edge of an artefact, resulting from use. Sometimes microscopic.
Significance	The heritage value assigned to an archaeological place or object by assessment against established criteria
Significance – archaeological	Archaeological significance of an archaeological place or object includes an assessment of its aesthetic, historical, scientific, representative, creative and/or technical significance, and/or its rarity. Age is not a criterion in the assessment of significance. (Just because something's old, doesn't mean you have to keep it.)
Significance – cultural	Cultural significance of an archaeological place or object includes an assessment of its social significance to associated cultural or community groups, including descendant communities.
Tangible heritage	See material culture, and artefact
UTM	Universal Transverse Mercator projection, the grid reference system adopted by Australia
Western	As applied to the coloniser / settler culture of Australia. In other documents, Western people may be referred to as 'European,' however Western is an inclusive term that recognises that many of the people discussed were Australian-born, of European heritage. The human occupation of the Northern Territory can be broadly and bluntly divided into Aboriginal occupation and Western occupation, which reflects which broad cultural group held power at the time. This blunt division does not have the nuance required to acknowledge the many distinct Aboriginal cultures, and the visitation or settlement in either occupation period by people from Southeast Asia or further afield.

Executive Summary

ERIAS Group engaged In Depth Archaeology, to conduct an archaeological survey and assessment of PNX Metals' Fountain Head Project, to support the Project's environmental impact assessment. PNX Metals have been actively exploring the area and were proposing to develop the Hayes Creek Projects which involved the mining of deposits at Mt Bonnie and Iron Blow with the haulage of ore to the Fountain Head site for processing. The survey and assessment includes the haul road route for the Hayes Creek Project and Fountain Head Project site. The Hayes Creek Project sites were surveyed in 2016 (Martin-Stone 2016). Following further exploration success at Fountain Head, PNX Metals' approach to developing the project has changed with mining and treatment of gold ore at Fountain Head followed by the later development of the Hayes Creek Project.

Principal archaeologist, Karen Martin-Stone, undertook the survey with Traditional Owner representatives, Phillip Goodman (Warai) and George Huddlestone Jabulgarri (Wagiman). The cultural heritage survey was carried out from 18-23 October 2019.

The survey was conducted in conditions of an extreme heatwave and varying ground surface visibility. Despite the limitations, the consultant and Traditional Owners recorded a total of 35 archaeological features, including 13 Aboriginal places, 8 Aboriginal objects, 6 combined Aboriginal and historical places, 6 historical places and 2 historical objects, as defined under the NT *Heritage Act* 2012 (Heritage Act). (See glossary for definitions of these archaeological feature types.)

This report includes an assessment of the significance of all features recorded during the survey, using the criteria defined in the Heritage Act. The most significant heritage place recorded in the survey was the combined Aboriginal and historical place of the original Grove Hill settlement. This site includes evidence of Indigenous people adapting introduced materials (metal and glass) for traditional purposes including spearheads and flaked tools. Another extensive combined Aboriginal and historical place located in the vicinity of the Port Darwin Camp Cemetery is also highly significant. These sites in particular have the potential to inform our understanding of the lives of people who lived through the 'contact period' of the Northern Territory's colonial history.

The Aboriginal places and objects documented by the survey demonstrate key aspects of pre-contact culture, and are significant under the terms of the *Heritage Act.*

This report details the survey methodology and results, and makes recommendations for the protection of archaeological sites and artefacts in accordance with the existing legislation. The current project footprint will not impact the majority of the recorded archaeological features. However, the current haul road plans may impact sites in the eastern part of the Fountain Head Project, and care must be taken not to impact adjacent sites when widening the haul road from Mount Bonnie to Fountain Head (see Figure 1 and Section 7).

Summary of Recommendations

Based on the survey results and the significance assessment contained herein, the consultant makes the following general recommendations.

1. That PNX and its contractors avoid all significant heritage places and objects, where possible.
2. That, if it is not possible to avoid disturbance of specific significant heritage places or objects, that they be salvaged archaeologically, in full consultation with Traditional Owners, and with all relevant permits. Further archaeological survey may be warranted to determine boundaries of places currently recorded as point data, due to limitations of ground surface visibility.

3. That, prior to any works, further survey be undertaken at Fountain Head in unsurveyed areas of high probability, and to document the condition of previously recorded archaeological sites, if the planned works are likely to affect these areas.
4. That, where the boundaries of a significant heritage place are mapped, they are implemented as a conservation buffer zone for that heritage place.
5. That a 100m conservation buffer zone be placed over Aboriginal places that are recorded as point data.
6. That a 50m conservation buffer zone be placed over identified Aboriginal objects.
7. That a Cultural Heritage Management Plan (CHMP) be developed, including measures for the induction of staff and contractors, management of unexpected finds, and management of identified heritage places and objects. The CHMP should also consider measures to deter fossickers and metal detectorists from causing further damage in the area (e.g. signage).
8. That the client maintains currency of all Authority Certificates in relation to sacred sites in the area. Queries about sacred sites should be directed to the Aboriginal Areas Protection Authority.

For site-specific management recommendations, see Table 6, Section 9. For heritage management recommendations within the Iron Blow and Mount Bonnie lease areas, refer to Martin-Stone (2016) at Appendix A.

Figure 1 shows a map of significant archaeological places and objects, in relation to the project footprint.

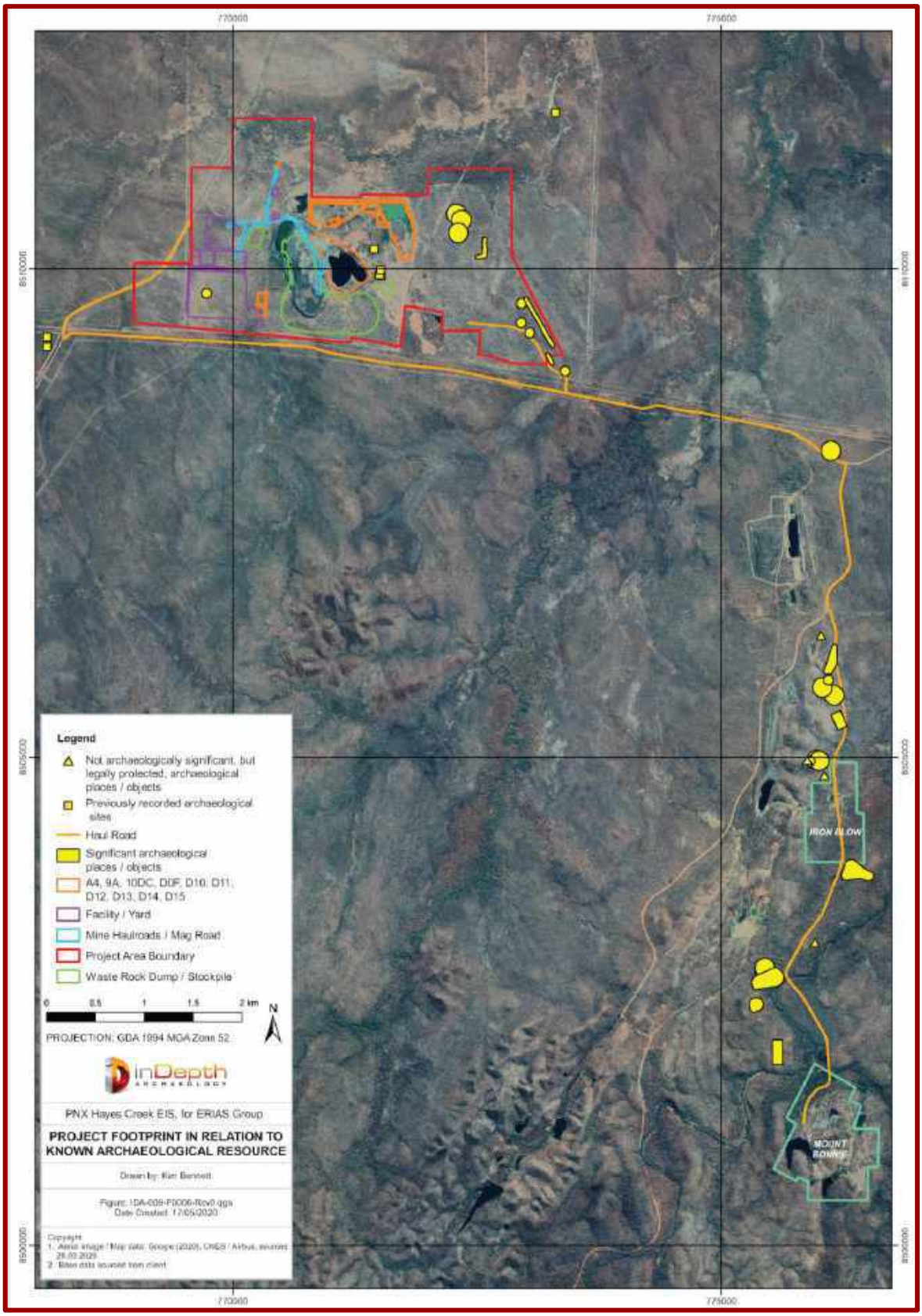


Figure 1: Defined significant archaeological resource in relation to the proposed project footprint

1.0 Introduction

Erias Group engaged Karen Martin-Stone, principal archaeologist of In Depth Archaeology, to conduct an archaeological survey of PNX Metals' Fountain Head Project, for the environmental impact assessment. The consultant contacted the Northern Land Council to confirm the appropriate Traditional Owner representative. The NLC confirmed that the area is Warai and Wagiman country, and recommended the consultant work with Philip Goodman and George Huddlestone Jabulgarri. Karen Martin-Stone undertook the archaeological survey between 18-23 October 2019, with the Traditional Owner representatives, Phillip Goodman (Warai) and George Huddlestone Jabulgarri (Wagiman), see Figure 2.

The survey and assessment includes the haul road route for the Hayes Creek Project and Fountain Head Project site. The Hayes Creek Project sites were surveyed in 2016 (Martin-Stone, 2016 – see Appendix A). The survey area is located approximately 170km south of Darwin, in the Pine Creek region (see Figure 3). The Hayes Creek Project includes establishing a new haul road between Mount Bonnie and Fountain Head, via Iron Blow; mining at both Mount Bonnie and Iron Blow. The Hayes Creek Project has been placed on hold while PNX Metals focus on the development of the Fountain Head Project. The Fountain Head Project includes constructing and operating a heap leach and processing facility and mining of the open pit at Fountain Head (see Figure 4).

This report outlines the legislative basis for heritage protection in the Northern Territory (NT), reviews the environmental and cultural background of the project area, and provides recommendations for the management of archaeological places and objects recorded during the survey.

The survey recorded 16 Aboriginal places, 8 Aboriginal objects, 4 combined Aboriginal and historical places, five historical places and 2 historical objects, as defined under the NT *Heritage Act* 2012. The findings of the survey are consistent with past archaeological surveys in the region, and fit the expectations of predictive models of site location in the region.

Kim Bennett prepared all maps for the fieldwork and report, for In Depth Archaeology. All mapping and site recording is in the GDA94 datum, UTM Zone 53.

Figure 2: Phillip Goodman & George Huddlestone Jabulgarri

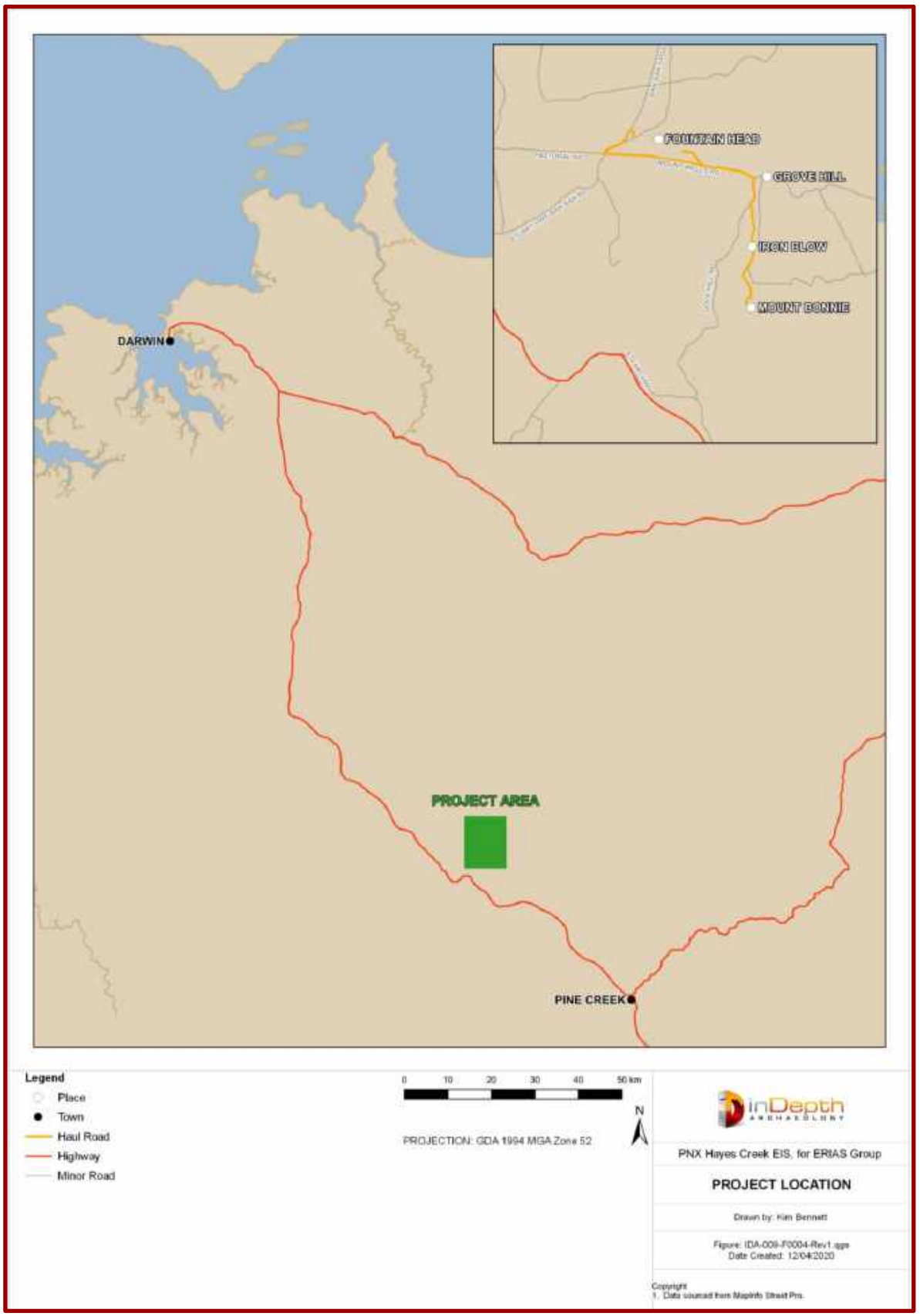


Figure 3: Location of survey area

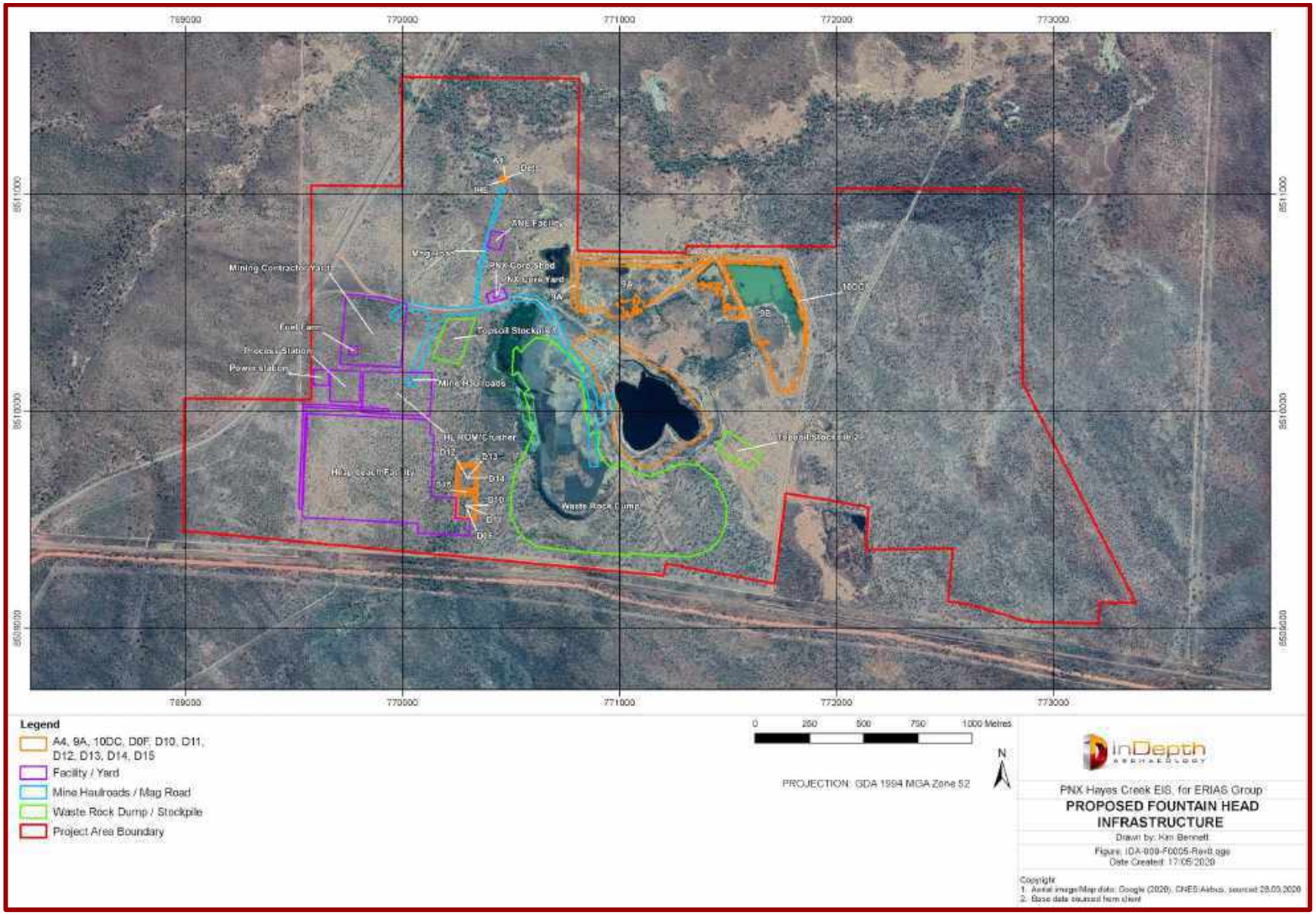


Figure 4: Proposed infrastructure at Fountain Head

2.0 Legislative Basis for Heritage Protection

Cultural heritage conservation legislation is complicated in Australian jurisdictions. This is the result of the evolution of the Australian constitutional framework, particularly the inclusion of new themes, such as Aboriginality, heritage and the environment into an existing regulatory framework. The result of this developmental change is that the Commonwealth retains responsibility for Indigenous issues, including some cultural heritage issues, while the States and Territories retain control of land use and development control areas. Therefore, both Commonwealth and Northern Territory Acts apply in particular circumstances within the Northern Territory.

2.1 Commonwealth Acts

***Aboriginal Land Rights (Northern Territory) Act* 1976 (ALRA):** The ALRA's primary purpose was to address land ownership issues for Indigenous Traditional Owners. The Act created a special type of freehold land. The ALRA also defined Sacred Sites as places 'sacred or otherwise of significance in the Aboriginal Tradition'. The Act provides for the formation of Land Councils, tasked with protecting the rights of all Aboriginal people in the NT, particularly in the areas of land claims under ALRA and the Native Title Act 1991. The Land Councils also advance Aboriginal employment and training, and participate in the management of mineral tenements on Aboriginal lands. Most non-mining developments on Aboriginal land require a land use agreement, usually known as a Section 19 Agreement.

The Fountain Head Project and Hayes Creek Project are not on Aboriginal land, and therefore this Act does not apply to the current proposed works.

***Native Title Act* 1993:** The Native Title Act gives some Aboriginal people the ability to access and use traditional lands for some purposes. Native Title claimants may enter into agreements with other interested parties, on the nature of land use and access to land, including the protection of cultural heritage resources. These agreements are known as Indigenous Land Use Agreements (ILUAs).

The project area is not subject to Native Title.

***Aboriginal and Torres Strait Islander Heritage Protection Act* 1984:** This Act is a site protection Act of 'last resort', meaning that the Act is meant to provide emergency protection for Aboriginal and Torres Strait Islander heritage sites when all other avenues have been exhausted. Generally an Indigenous group must apply to the Minister to have protective covenants placed over an area or site. The power to provide such protection resides in Section 51 of the Constitution giving the Commonwealth powers on Aboriginal issues. Therefore this Act may override all State and Territory cultural heritage acts where there are conflicting provisions.

***Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act):** The EPBC Act is the Commonwealth Government's main piece of environmental legislation. It provides a legal framework to manage significant natural and cultural heritage places. With regard to cultural heritage, the Act proscribes the criteria for listing National Heritage places and Commonwealth heritage places, and management principles for same.

The introduction of the EPBC Act created two new heritage registers, the National Heritage List, and the Commonwealth Heritage List. These registers replaced the Register of the National Estate.

- The National Heritage List is a list of natural, historic and Indigenous places that are of outstanding significance to the nation.
- The Commonwealth Heritage List is a list of natural, historic and Indigenous heritage places that are owned or controlled by the Australian Government.
- The Register of the National Estate is no longer a statutory list. It is being maintained as an archive of information regarding more than 13,000 places throughout Australia.

As the Commonwealth has no powers in regards to land use (other than on Commonwealth owned lands) the power emanating from the EPBC Act resides in the Commonwealth's powers to negotiate funding and other arrangements in relation to conservation of heritage places.

2.2 Northern Territory Acts

The NT Aboriginal Sacred Sites Act 1989 protects sites that are 'sacred and otherwise of significance in the Aboriginal Tradition'. Sacred Sites are protected whether the location of the sites are known or not by any person or company seeking to do work on lands. The Aboriginal Areas Protection Authority (AAPA) administers the Act. The AAPA can issue a Certificate indemnifying a proponent for an area upon application and payment of a fee. The Certificate may contain conditions limiting or preventing works in and around registered and recorded Sacred Sites. The Authority Certificate will contain maps outlining any restricted work areas in the area of application.

The NT Heritage Act (2012) establishes the Heritage Council and the Heritage Register, protects significant heritage places and objects, and sets penalties for offences against the Act. The Heritage Act provides automatic protection for Aboriginal and Macassan archaeological places and objects, which are automatically declared heritage places and objects. The Act also sets the process by which other significant places or objects may be added to the Heritage Register, and afforded protection under the Act. The Act allows for processes to approve works, research and maintenance on a declared heritage place or object. There are penalties for accidental or deliberate destruction, amongst other offences.

3.0 Physical Environment

The survey area is located within the Pine Creek Geosyncline, a large intrusion of mineral rich ore seams that have formed the basis of the mining industry in the Hayes Creek, Pine Creek and Katherine regions since the 1870s.

In archaeological terms the underlying geology indicates:

1. The Burrell Creek Formation contains greywacke, siltstone, sandstone and shale, which are likely to be present in and near the survey area. Fine to coarse feldspathic metagreywacke occurs in nodules and outcrops in the region. This is sometimes referred to as tuff. It is an isotropic rock with well-developed conchoidal fracture properties, and is well suited to use in the production of axes and blades. It is amongst the most prominent raw materials in most stone artefact assemblages in the Top End, and numerous quarry sites have been recorded in the region (Martin-Stone & Woolfe, 2012).
2. Quartz outcrops occur occasionally in the region. These rocks are also among the dominant raw materials in most stone artefact assemblages in the Top End. However, the relatively low availability of quartz in the survey region, compared to greywacke / tuff, means it is less likely to be the dominant raw material in assemblages in the Project Area.
3. Granite and granitic sands in the Pine Creek Geosyncline. Granitic intrusion into existing sedimentary formations caused mineralization and the alteration of rocks. The heat and pressure of the igneous intrusions has caused the formation of occasional chert nodules in limestone deposits that are used as the raw material for some stone tools.

Pietsch and Stuart Smith (1987:4) describe three geomorphological units relevant to the Project Area:

1. Dissected Foothills: Skeletal gravelly and lateritic soils on rubbly rises and low hills dissected by small perennial watercourses. The vegetation on these units is generally mixed stunted woodland grading to open eucalypt woodland dominated by Corymbia miniata and Eucalyptus tetradonta.
2. Dissected Uplands: Shallow gravelly and rocky skeletal soils on prominent strike ridges and boulder strewn hills. The vegetation is generally mixed open eucalypt woodland.
3. Alluvial Plains: Black soil and sand plains often fill between strike ridges, hills and rises. These enlarge toward the north of the region and toward the larger estuarine and coastal plains. Alluvial plains aggrade over time covering artefacts and sites. Hence it is unlikely to find many archaeological sites in these areas, however some do exist. Vegetation on alluvial plains is dominated by mixed eucalypt woodlands, grassland among stands of Pandanus spiralis and Livistona humilis.

The project area generally consists of open woodland on low sandstone hills and floodplains, with a grass understorey. The vegetation is dominated by Corymbia miniata and Eucalyptus tetradonta, with ironwood also present in small numbers.

Vegetation growth during the wet season often impedes ground visibility throughout the Top End. This report notes areas of low visibility that were unable to be surveyed yet exhibit archaeological potential.

4.0 Cultural Background

4.1 Archaeological background

The arrival of modern humans onto Sahul (continental Australia) has been dated to approximately 65,000 years ago (Clarkson, et al, 2015). These dates were obtained from samples taken from a site in Kakadu National Park, indicating broader occupation of the Top End region. Archaeologists believe that the most likely region of arrival was the Kimberley and Top End coastline. Much lower sea levels at the time mean that the earliest occupation sites are likely to be underwater.

The archaeological record of the Top End region shows very gradual change in material culture throughout this late Pleistocene period and into the mid-Holocene (around 5,000 years ago). The early stone tool industry is known as the 'Australian core tool and scraper tradition.' It is characterised by large core tools, and steep-edged, chunky, high-backed scrapers (Flood, 1995:49). Ground-edged axes first appear in the archaeological record at about 35,000 BP (Geneste, et. al., 2010). By 23,000 BP they became more common in Kakadu, and some featured waists for hafting (Flood, 1995:88).

In the mid-Holocene, approximately 5,000 BP, an abrupt change occurred in the archaeological record with the introduction of the Australian small tool tradition, and the subsequent arrival of the dingo approximately 4,000 BP (Flood, 1995:221). The Australian small tool tradition is characterised by smaller, more delicate tools including backed blades, points, tulas and burren adzes. The changes in the stone tool tradition in the mid-Holocene were accompanied by changes in rock art styles and an increase in charcoal, animal bone, artefacts, shellfish and ochre in archaeological deposits. Flood & David (1994) hypothesise that the arrival of stone point technology coincided with the systematic manufacture of blades approximately 3,000 years ago.

The specific chronology of Indigenous occupation of the project area is less well understood, owing to a lack of archaeological excavation of stratified deposit, however it is highly probable that it broadly reflects the chronology of cultural change in the broader Top End region. A large number of archaeological surveys have been conducted in the Hayes Creek / Pine Creek / Katherine area, in association with mineral exploration, mining and other development (see Baker & Hughes 1983; Baker 1983a, 1983b; Bell 1981, 1983; Brockwell & Cane 1987; Crassweller 2006a, 2006b, 2006c, 2008, 2011a, 2011b, 2011c, 2012a, 2012b; Cundy 1987; Earth Sea Heritage Surveys 2008, 2013; Guse 1995, 1997, 1998; Hill 2005; Hiscock 1991; Hiscock & Mowat 1991; Keys & Woolfe 2013; Kinhill Engineers 1992; Kinhill 1989; Lance 1990; Martin-Stone 2016; Martin-Stone & Woolfe 2011, 2012, 2013; Mitchell 1993a, 1993b, 1994a, 1994b; Mulvaney & Hermes 1988; Mulvaney 1992; Paton 1993; Raupp et al 2009; Tacon 1988; Woolfe 2013; Woolfe & Martin-Stone 2011, 2012).

The archaeology of the Pine Creek region is homogenous, and distinct from the archaeology of the escarpment country of Kakadu and Western Arnhemland, owing to the characteristics of the Pine Creek Geosyncline. The geology of the area, particularly outcropping stone referred to in various reports as hornfels, tuff, Burrell Creek Formation or feldspathic metagraywacke, provides excellent raw material for the manufacture of axes, blades, points and other flaked artefacts. A 2009 review of archaeological sites recorded within the Pine Creek 1:100,000 map sheet (Earth Sea Heritage Surveys 2008) found a significant proportion of sites in the region to be quarry sites with artefact scatters (see Figure 3). Many more archaeological surveys since then have recorded numerous quarry sites, and confirmed their dominant representation in site types of the region.

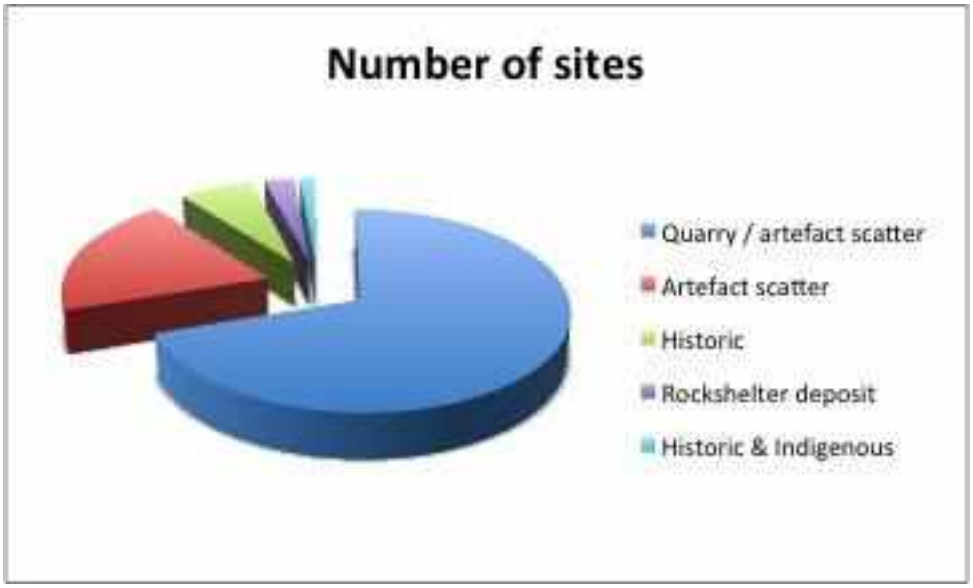


Figure 5: Distribution of archaeological site types within the Pine Creek 1:100,000 map sheet (after Earth Sea Heritage Surveys 2008)

The quarry sites with associated artefact scatters are consistently distributed across specific landscape features – they are most commonly recorded on ridges, hill slopes and creek lines. The sites range in size and density, and have been categorised as major or minor quarries (Mulvaney 1992). Hiscock (1991) suggests variability in the sites reflects chronological differences as well as raw material quality. Baker (1983) and Mulvaney (1992) hypothesised that Aboriginal people quarried long flakes (large blades) in the quarry sites, and these were transported to knapping floors for further reduction, eventually discarded in campsites as fully finished tools. Martin-Stone & Woolfe (2013) confirmed this multi-stage reduction of tools across the landscape with their analysis of a sample of surface artefacts within the Mount Todd site MT26, which was estimated by Paton (1993) to contain 45 million artefacts.

The artefact types that have been documented within the region are flakes, cores, retouched flakes, flaked pieces, unifacial points, bifacial points, Kimberley points (rare), ground-edged axes, flaked axes, axe blanks, blades, bipolar-percussed blades, hammer stones, grindstones (mortars and pestles), and debitage (tiny waste flakes from the knapping process). Average artefact densities vary greatly on sites and in the isolated background scatter. Raw material types are dominated by the material variously called hornfels / tuff / Burrell Creek Formation / feldspathic metagraywacke, then quartz, followed by lesser amounts of siltstone, quartzite, sandstone, silcrete, fine grained sedimentary (FGS), dolerite and chert.

4.2 Historical background

The Indigenous occupation of the region did not cease with the arrival of colonial cultures, and continues to the present day. The Aboriginal people of the region experienced colonial history in parallel with Western and Asian arrivals, often working together in trade and on mines, pastoral stations and the war effort, while also being subject to some of the worst impacts of the historical era including the Stolen Generation, massacres of Indigenous people by police and pastoralists, loss of

land, lost wages and the Japanese bombing raids of World War II (Coleman, pers. comm.; Merlan 1998; Pearce 1982).

The historical period commenced in the broader Pine Creek region with the explorer John McDouall Stuart who traversed through the area in 1862. Stuart noted that the region may be rich in alluvial gold. This was confirmed in December 1870, when workmen constructing the Overland Telegraph Line (OTL) discovered enough gold to trigger a gold rush to the region (Pearce 1982). The OTL was the first communication link of its time that connected Australia with the rest of the world. Running from Adelaide to Darwin, and then by undersea cable to Indonesia, its opening in 1872 revolutionised communication between the colonies and Great Britain (Powell 2000).

The first mining boom in the broader Pine Creek region ran from 1872 – 1874. The area has subsequently ridden a boom and bust economy that peaked in the 1870s, 1880s, 1900s, 1930s, 1960s-'70s (Jones 1987), and the early 21st Century. In addition to the township of Pine Creek, smaller settlements established in closer proximity to the mines, including Bridge Creek, Hayes Creek, Burrundie, Mount Wells, Grove Hill, Union Reef and others. While the region is known for gold, it has also been mined for wolframite, lead, tin, copper, silver and uranium (Donovan 1979). Early mining ventures struggled with geographic isolation, challenging climate, mismanagement and the changing price of the commodities market (Jones 1987).

The mining booms brought associated industry and services, often run by Chinese merchants (Jones 1987). The Chinese workforce was essential to the operations of the mines, and concessions to the White Australia Policy were made by the Northern Territory Administration in order to maintain the viability of the broader NT economy (Powell 2000). The Chinese community outnumbered Westerners in the NT in the 1880s, and went on to become a well-established community in both Darwin and Pine Creek, and surrounding settlements, remaining even in times of bust.

The pastoral industry was slower than mining to establish in the Pine Creek region, and many early attempts failed due to the challenges of climate, stock diseases, and isolation from market (Powell, 2000). The industry continues to the present day, often alongside exploration and mining on the pastoral leases.

The railway played a large part in the economic viability of the region. Construction of the line from Darwin to Pine Creek commenced in 1886. It reached Burrundie in 1888, and Pine Creek in 1889. It was extended to Emungalan (Katherine) in 1917, and further south to Birdum in 1929. The corridor it followed was roughly the same route as Stuart's overland trek. A railway branch extended to the east of Pine Creek, which connected Burrundie, Twelve Mile and Union Reef to the main line. The railway was operational until the mid-1970s, and later was replaced by the North Australian Railway, which connected Adelaide to Darwin, opening in 2003.

The railway was a piece of critical infrastructure for operations in World War II, during which time Pine Creek served as a communication centre, a staging post and the base for ten military units. Civilians (mainly non-Indigenous) were evacuated from the Pine Creek region when the Top End came under full military control from 1942-1946. Mining ceased abruptly at this time (Bell 1983, Donovan 1979).

Since WWII, the area has experienced two more mining booms, and the introduction of a viable tourism industry capitalising on its mining heritage and proximity to Kakadu National Park and the Katherine region.

5.0 Methodology

The survey was carried out by project archaeologist, Karen Martin-Stone (In Depth Archaeology) and Traditional Owner representatives, Phillip Goodman and George Huddlestone Jabulgarri. The survey was scheduled for 19-23 October 2019, and coincided with an extreme heat wave. Average maximum temperatures for the week were 43 degrees Celsius, with very high humidity. These conditions affected how much ground could be safely covered each day by the survey team. Visibility was generally quite good across the survey area, although some areas remained unburned and had consequently low or zero surface visibility.

The survey plan was based on project data provided by the client, including proposed haul route options and infrastructure at Fountain Head. The team focused on areas of proposed disturbance, plus inspection of areas with high archaeological potential, taking into account the patterning of archaeological sites previously found in the region, identified areas of Traditional Owner concern, sampling requirements and level of proposed disturbance.

The archaeological survey aimed to locate and record any archaeological places or objects, as defined by the NT *Heritage Act* 2012. The aim of the survey was to identify and record archaeological evidence within a reasonable sample of the predominant landforms (ridges, valleys, plains and watercourses). The archaeological survey used stratified random sampling and purposive sampling, with a particular focus on areas of proposed disturbance. These methods are in accordance with standard practice for field archaeology (see Burke & Smith, 2004:68).

5.1 Identification of archaeological places and objects

Archaeological places and objects are otherwise referred to as sites and artefacts. There are many different site types commonly found in Australian archaeology (Burke & Smith 2004, Pearson & Sullivan 1995). Common site types found across the Northern Territory are:

- **artefact scatters:** These may contain flaked or ground stone artefacts and hearthstones. They may occur as stratified deposits or surface scatters of artefacts.
- **shell middens:** These sites are usually mounds of discarded shell and other artefacts, associated with coastal occupation. The mounds can be quite large – 8m tall middens have been recorded in the Northern Territory.
- **rock art sites and shelters:** These sites may contain paintings, stencils or engraved art, along with artefacts indicating occupation.
- **stone arrangements:** These sites exhibit the deliberate construction of cairns, lines or polygons with stone. They may be small, such as a single cairn, or large and complex, covering hundreds of metres.
- **quarries of stone and ochre:** These sites are generally locations where outcropping stone has been flaked for the removal of material used to make stone tools. The sites can occur on very small outcrops, or as major industrial complexes at the centre of vast trading networks.
- **burials:** These sites include human remains in all forms of burial practice, including interment, exposure and the depositing of remains in rock shelters.

- **isolated stone artefacts:** These artefacts occur as background scatter across the landscape, and are integral to understanding the patterns of occupation, as well as trade networks and other past life ways.
- **culturally modified trees:** These trees have been scarred or felled in activities ranging from accessing food sources (e.g. honey), or the manufacture of wooden artefacts including didgeridoos, bark canoes, and food containers.
- **built heritage**, including industrial and maritime sites, and
- **isolated historical artefacts**, commonly made of metal, glass or ceramic.

Boundaries of archaeological places are not always readily identifiable, due to limitations of visibility, disturbance or time. Where the boundaries of an archaeological place could be reasonably inferred, these are mapped in the results, and labeled 'extensive' (historical / Aboriginal) places. Where limitations prevented the mapping of reasonably inferred boundaries, GPS co-ordinates were recorded and used as a centroid for an appropriately sized conservation buffer. These were simply labeled historical or Aboriginal places. The consultant erred on the side of caution in the application of buffers, to prevent any inadvertent damage within undefined site boundaries. The use of the word 'extensive' is not intended to imply anything regarding artefact densities or nature of occupation of the site.

5.2 Identification of stone tools

Stone is the most durable material in the archaeological record, and therefore the most commonly found artefacts are made from this raw material. The ability to accurately differentiate between natural stone and culturally modified stone artefacts is key to the documentation and management of heritage places and objects.

Each time sufficient force is placed on the surface of an isotropic rock it will fracture into two pieces. The fragment that has been struck contains the ring-crack, where fracture was initiated, and is called the flake. The flake is usually the smaller of the two pieces of stone. The larger fragment, from which the flake has been removed, is called the core. On both the flake and the core the surface that is struck is called the platform. Flakes are identified by the distinctive surface created when they are removed from the core. The classification of artefacts in this survey was based on identifiable characteristics outlined by Hiscock (1984).

For an object to be classed as a flaked artefact, it needed to possess one or more of the following characteristics:

- A positive or negative ring crack;
- A distinct positive or negative bulb of percussion;
- A definite eraillure scar in an appropriate position beneath a platform; and
- Remnants of flake scars (dorsal scars and ridges).

These characteristics indicate the application of a controlled external force to a core.

The primary form of artefacts recorded in this analysis has been derived from Holdaway & Stern (2004):

- Flake: Flakes exhibits a set of characteristics that indicate they have been struck off a core. The most indicative characteristics are ring-cracks, which show where the hammer hit the core. The ventral surface may also be deformed in particular ways, for example a bulb or eraillure scar. Flakes were recorded as complete, proximal, medial, distal or longitudinally split;
- Blade: blades are flakes that are at least twice as long as they are wide, with parallel edges (Holdaway & Stern 2004:16). Blades were recorded as complete, proximal, medial, distal or longitudinally split;
- Core: A piece of stone with one or more negative flake scars, but no positive flake scars. Cores were recorded as unidirectional, bidirectional, bifacial, multidirectional or bipolar;
- Angular fragment / flaked piece: an angular fragment does not easily fit into other categories. This category is used only when an artefact was definitely chipped but could not be placed in another group.

The consultant uses the term ‘debitage’ to refer to very small waste flakes produced during the manufacture of tools. There has been some disagreement amongst archaeologists regarding the appropriate application of the term (Holdaway and Stern, 2004:154), as some archaeologists use it to refer to any flake that has not been retouched. The consultant differentiates between unretouched flakes (‘flakes’ or ‘flaked pieces’) that were often used for various purposes, and waste flakes generally <20mm in size (‘debitage’) that are concentrated in the location of manufacture and appear to have not been utilised as tools.

Formal tool types that have been identified in northern Australia are listed below following characteristics as outlined by McCarthy (1976), Kamminga (1982) and Holdaway and Stern (2004) include:

- Unifacial Points are flakes that have been retouched along the margins from one surface (either dorsal or ventral) to give or enhance its pointed shape. These unifacial points are sometimes symmetrical or leaf shaped;
- Bifacial Points are retouched onto both ventral and dorsal surfaces of a flake to enhance or give the artefact its point shape. These points may have the platform removed and the proximal end rounded;
- Serrated Points (otherwise known as Kimberley Points) are bifacially flaked points that have serrated margins;
- Bipolar Blades are blades that have been flaked with the core placed on an anvil. This bipolar percussion often results in a bulb of percussion at both ends of the blade.
- Edge ground axes. Classified primarily by the shaping process of flaking, pecking and polishing. These generally have only one working edge that has been ground to a sharp margin but there are also examples with two leading edges;
- Grindstones are characterised by a worn and abraded surface/s. The surface may either have concave depression of a convex surface;
- Hammer stones show use wear on the surface in the forms of abrasion, pitting and edge fracturing with some negative scarring from the process of producing stone tools; and
- Pounders are artefacts that are used primarily for processing food and plant materials.

5.3 Information management

The location of all archaeological features was recorded using a handheld Garmin GPS64s unit, in UTM GDA94 (Z52). They were mapped by Kim Bennett, for In Depth Archaeology. Standardised site recording forms, adapted from Burke & Smith (2004), were used to record the details of the sites. The archaeological features were given identification numbers to correspond with the date and time of the recording, to match with photo metadata.

6.0 Results & Discussion

The archaeological survey recorded a total of 35 archaeological features. These included Aboriginal and historical places and objects, as summarised in Table 1. The *Heritage Act* presumptively protects Aboriginal places and objects. This means that the Act protects them whether or not their location is known or recorded. They must not be disturbed without a permit under the Act.

The Iron Blow and Mount Bonnie areas were assessed in 2016. Recommendations for the management of archaeological places and objects in these areas can be found in the 2016 report, at Appendix A.

The results of the current archaeological assessment are detailed below, by survey area, including maps and discussion per area. The location of archaeological sites recorded in the 2019 survey conformed to previous patterning of sites recorded across the Pine Creek Geosyncline region.

Table 1: Summary of frequency of archaeological features

Feature Type	Fountain Head	Haul Road North	Haul Road South	Total
Aboriginal object	5	3	-	8
Aboriginal place	6	5	2	13
Aboriginal and historical place	-	3	3	6
Historical object	-	1	1	2
Historical place	-	1	4	5
Recent historical place	-	1	-	1
Total:	**11**	**14**	**10**	**35**

The Aboriginal objects were isolated stone artefacts, some of which may have formed part of larger sites in the past but were now recorded in disturbed conditions. Isolated artefacts are quite common across the Northern Territory, and this 'background scatter' can tell us about patterns in the way Indigenous people used the landscape and their tools. However, when they occur in disturbed conditions this affects their context and the amount of information that can be derived from them.

The Aboriginal places recorded during the survey included everyday occupation sites, plus some quarry sites and places of stone tool manufacture. In 6 cases, Aboriginal places and historical places were recorded in the same location. While it is sometimes not possible to determine whether Indigenous people and Westerners occupied these places at the same time, it is clear at the original site of the Grove Hill settlement (site 201910201115 – discussed and mapped in Section 6.3) that Indigenous people and Westerners were there at the same time. This is evidenced by a number of examples of glass bottle bases being knapped by Indigenous people, to make glass tools in the same way as they manufactured stone tools.

The historical places and objects documented in the survey relate to the history of mining occupation in the area. A search of the relevant heritage registers found no sites listed on the Commonwealth Heritage List or National Heritage List. The Grove Hill Hotel is listed on the NT Heritage Register, and was previously listed on the Register of the National Estate (archived list). The tramline section from

Grove Hill to Iron Blow was nominated to the NT Heritage Register in 2009, however as there were very little physical remnants, the nomination was allowed to lapse with the introduction of the new *Heritage Act* in 2012. The archaeological survey did not record any physical remnants of the tramline.

The Port Darwin Cemetery is listed on the register of the National Trust. The Genealogical Society of the Northern Territory has researched the documented history of cemeteries in the NT, including cemeteries that were known to exist at Fountain Head (1879-1910) and Yam Creek (1873-1901) (O'Brien, 2012). Traces of these cemeteries were not recorded during the archaeological survey, so their location has not yet been positively identified. A memorial headstone for Richard Wilcox, who died at Yam Creek in 1873, was placed immediately to the west of the Iron Blow boundary by family members in 1984 (see Figure 6). It is highly unlikely that the position of this memorial stone correlates to the position of the Yam Creek Cemetery.

Due to the known (but unlocated) existence of historical cemeteries, and the probability of Aboriginal burials across the region, the potential for encountering human remains during works cannot be ruled out.

Figure 6: Memorial to Richard Wilcox (picture supplied)

6.1 Fountain Head

The archaeological survey of Fountain Head recorded 6 archaeological places and 5 archaeological objects, as defined under the *Heritage Act*. These Aboriginal places and objects are presumptively protected by the Act. Any disturbance of these places and objects requires a permit authorised under the terms of the Act.

The Fountain Head results are summarised in Table 2, below, and detailed on the following pages. The locations of archaeological places or objects recorded during the survey are mapped in Figure 7.

Table 2: Summary of survey results – Fountain Head area

Site Name	Site Type	Easting	Northing
201910220850	Aboriginal object	773401	8508951
201910221030	Aboriginal object	772954	8509645
201910221040	Aboriginal object	772952	8509447
201910221045	Aboriginal object	773040	8509343
201910221220	Aboriginal object	769730	8509747
201910221500	Aboriginal place	772286	8510563
201910221510	Aboriginal place	772339	8510499
201910221515	Aboriginal place	772308	8510368
201910220900	Aboriginal place	773266	8509032
201910220945	Aboriginal place	773275	8509213
21910221545	Aboriginal place	772580	8510129

The map shows that the archaeological sites are concentrated in the eastern portion of the Fountain Head survey area. This is primarily due to the nature of the landscape in this area, comprising low hills with preferred stone resources, in relatively close proximity to the Yam Creek seasonal watercourses. The consultant and Traditional Owners surveyed the area in the west, and found only one isolated artefact. Due to the nature of the land system in this western area – being relatively flat plain without any hills to catch breezes, and no easily accessible watercourses – there is a low probability of finding more archaeological places and objects in the area. The disturbed area, as defined in client provided data (see Figure 7), is unlikely to have any further archaeological places or objects.

Due to time constraints and extreme weather conditions, the survey team could not complete the survey in the central northern part of the Fountain Head survey area. There is a moderate to high probability of locating archaeological places and objects in this area, so it is recommended to complete further archaeological assessment prior to any ground disturbance works in the vicinity. There was also insufficient time to complete a condition check of previously recorded archaeological places (Crassweller 2006a). This should be completed if any ground disturbance works are planned in these areas in future.

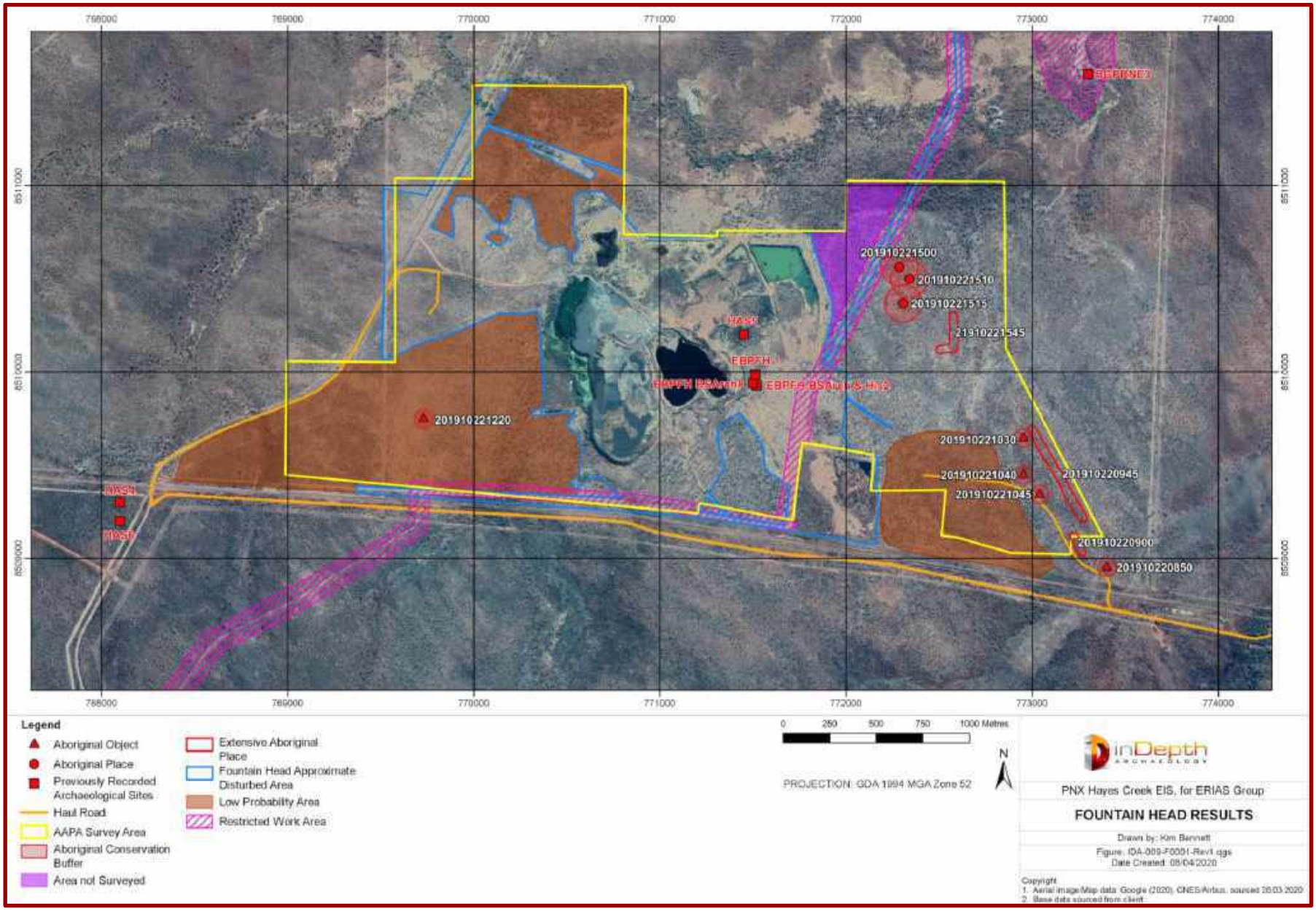
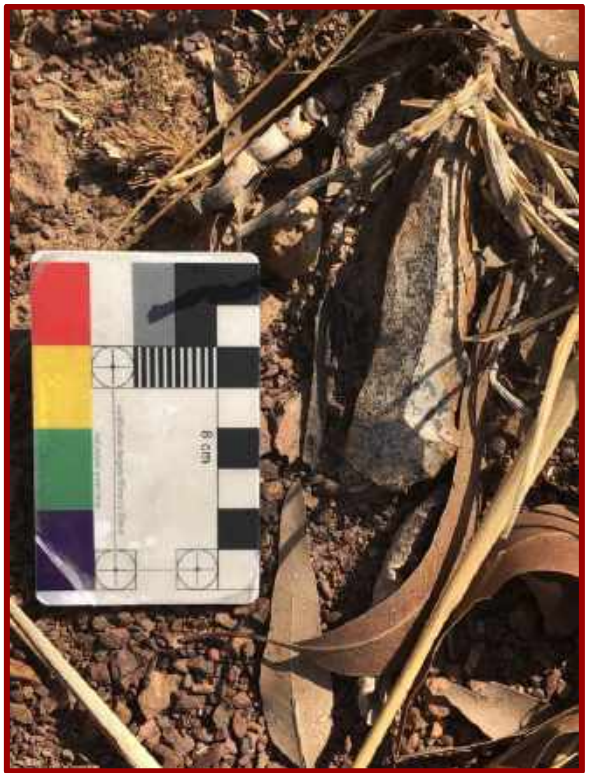


Figure 7: survey results, Fountain Head area

6.1.1 – Aboriginal object 201910220850

Location: 773401E, 8508951N
Condition: Good
Description:
Three artefacts (2 x unifacial points, 1 x blade) within 5m^2, on low ridge. Disturbance factor: grazing stock.

Figure 8, a-d: Isolated artefacts and their site context



6.1.2 – Aboriginal object 201910221030

Location: 772954E, 8509645N
Condition: Good
Description:
Feldspathic metagreywacke retouched blade, 50m from ridge site.

Figure 9: Retouched blade

6.1.3 – Aboriginal object 201910221040

Location: 772952E, 8509447N
Condition: Not recorded
Description:
Broken feldspathic metagreywacke bifacial point. Distal break.

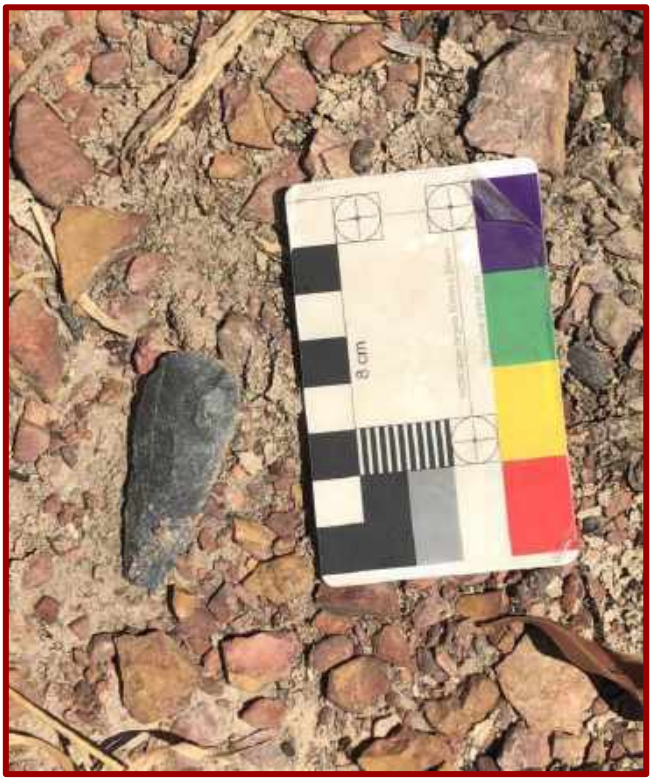


Figure 10: Bifacial point

6.1.4 – Aboriginal object 201910221045

Location: 773040E, 8509343N
Condition: Not recorded
Description:
Quartz cobble core with 2 negative flake scars from 2 platforms.

Figure 11: Quartz cobble multiplatform core

6.1.5 – Aboriginal object 201910221220

Location: 769730E, 8509747N
Condition: Not recorded
Description:
Feldspathic metagreywacke flaked piece.

Figure 12: Feldspathic metagreywacke flaked piece

6.1.6 – Aboriginal place 201910221500

Location: 772286E, 8510563N
Condition: Not recorded
Description:
Low density stone artefact scatter (max 2 artefacts per 1m^2). Includes stone, green bottle glass, metal. Approximately 50+ artefacts - flake, broken flake, flaked piece. The stone artefacts are 100% tuff.

Figure 13, a-c: Site context, green bottle glass, flaked piece

Figure 14, a-b: Broken flake, flake

6.1.7 – Aboriginal place 201910221510

Location: 772339E, 8510499N
Condition: Not recorded
Description:
Low density artefact scatter, stone artefacts only. Approximately 15 artefacts in 20m^2 area. Flake, broken flake, bifacial point.

Figure 15: Site context

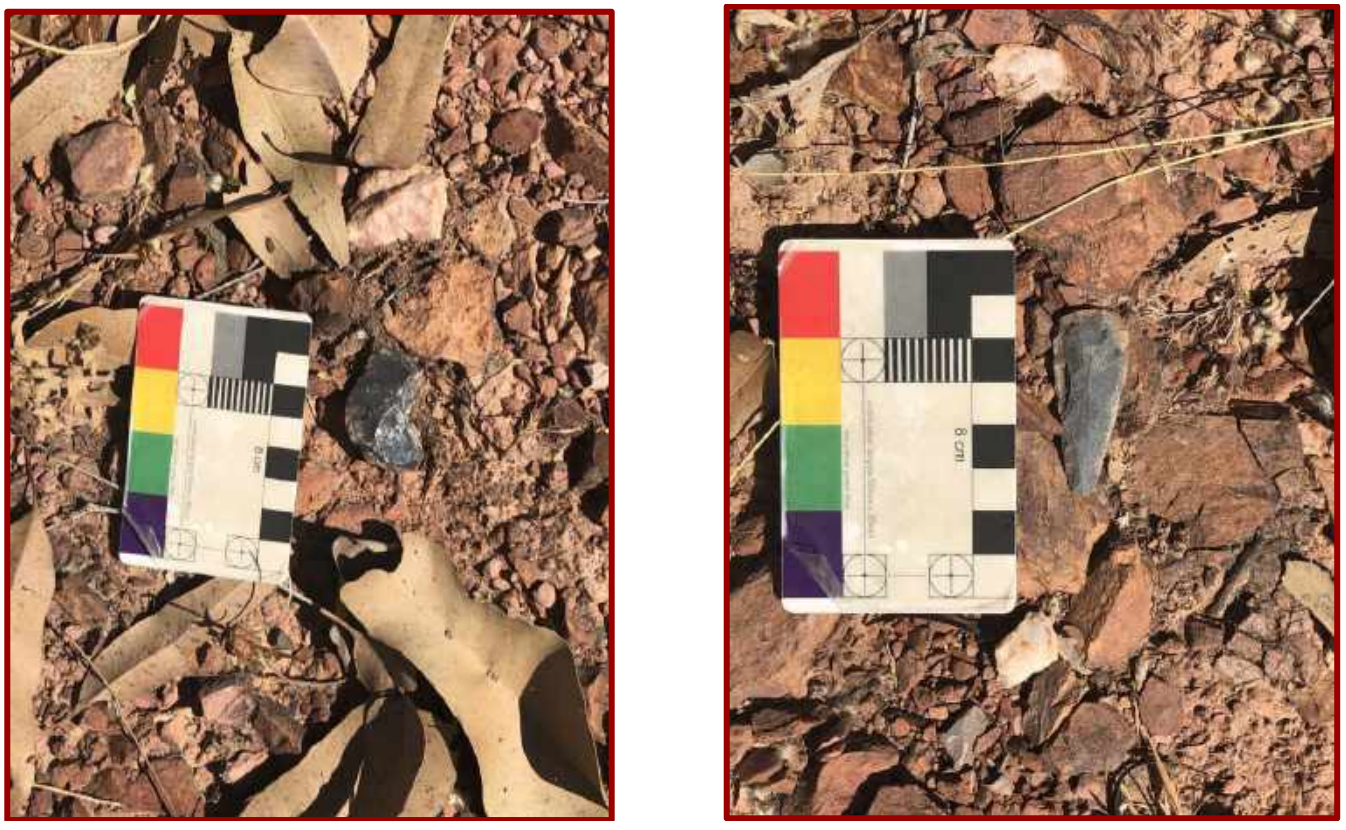
Figure 16, a-c: flakes, and a broken bifacial point with use wear

6.1.8 – Aboriginal place 201910221515

Location: 772308E, 8510368N
Condition: Good – in situ. Disturbance factors: grazing stock.
Description:
Over 500 artefacts, of quartz 50%, tuff 45%, greywacke 5%. Stone artefacts only, maximum artefact density 20/m^2. Artefact types include whole flake, broken flake, flaked piece, blade, unifacial point, bifacial point. One of the quartz artefacts has residue of resin, indicating it was hafted onto an implement for use.

Figure 17, a-b: Site context, and quartz artefact with hafting resin

Figure 18, a-d: A range of stone artefacts within the site



6.1.9 – Aboriginal place 201910220900

Location: 773266E, 8509032N

Condition: Good – in situ. Disturbance factors: grazing stock.

Description:

Stone artefact scatter, 150+ artefacts. One chert flaked piece, small quartz quarry, most artefacts feldspathic metagreywacke or tuff. Broken hammer stone. Low density of artefacts across whole ridge, with clumps of higher density. Artefact types include whole flake, broken flake, flaked piece, core, hammer stone, blade, unifacial point, bifacial point.

Figure 19, a-b: Site context, and bifacial point

Figure 20, a-b: Chert flaked piece, hammer stone

6.1.10 – Aboriginal place 201910220945

Location: 773275E, 8509213N

Condition: Good – in situ. Disturbance factors: grazing stock.

Description:

Over 2,500 artefacts. Artefact scatter continues across entire ridge, at varying levels of density. High density artefact scatter at highest point ridge. Knapping floors, manuports (non modified pieces of stone, carried into the site from elsewhere), diverse raw materials (metagreywacke 50%, quartz 49%, chert 1%, silcrete n=1). Site faces N/NE, towards Yam Creek. Artefact types include whole flake, retouched flake, broken flake, flaked piece, core, grindstone, hammer stone, blade, unifacial point, bifacial point, debitage, unifacial point blanks / preforms. Maximum density = 50/m^2 (at 773198E, 8509327N). Interesting artefacts include a cobble core and grindstone.

Figure 21, a-b: Site context

Figure 22, a-d: Broken hammer stone, quartz & tuff artefacts, unifacial point, axe blank

Figure 23, a-c: Silcrete broken flake, unifacial point pre-form, dolerite grindstone

6.1.11 – Aboriginal place 201910221545

Location: 772580E, 8510129N
Condition: Good – in situ. Disturbance factors: grazing stock.
Description:
Over 1,000 artefacts. Hilltop stone artefact scatter with knapping floors. 90% tuff / greywacke, 9% quartz, 1% dolerite. Site contents are clustered and scattered. Artefact types include whole flake, broken flake, flaked piece, hammer stone, blade, unifacial point, bifacial point, debitage. Site continues in varying degrees of density along the ridgeline, including lower areas of gravel exposure. It was recorded in conditions of 50% visibility.

Figure 24: Site context

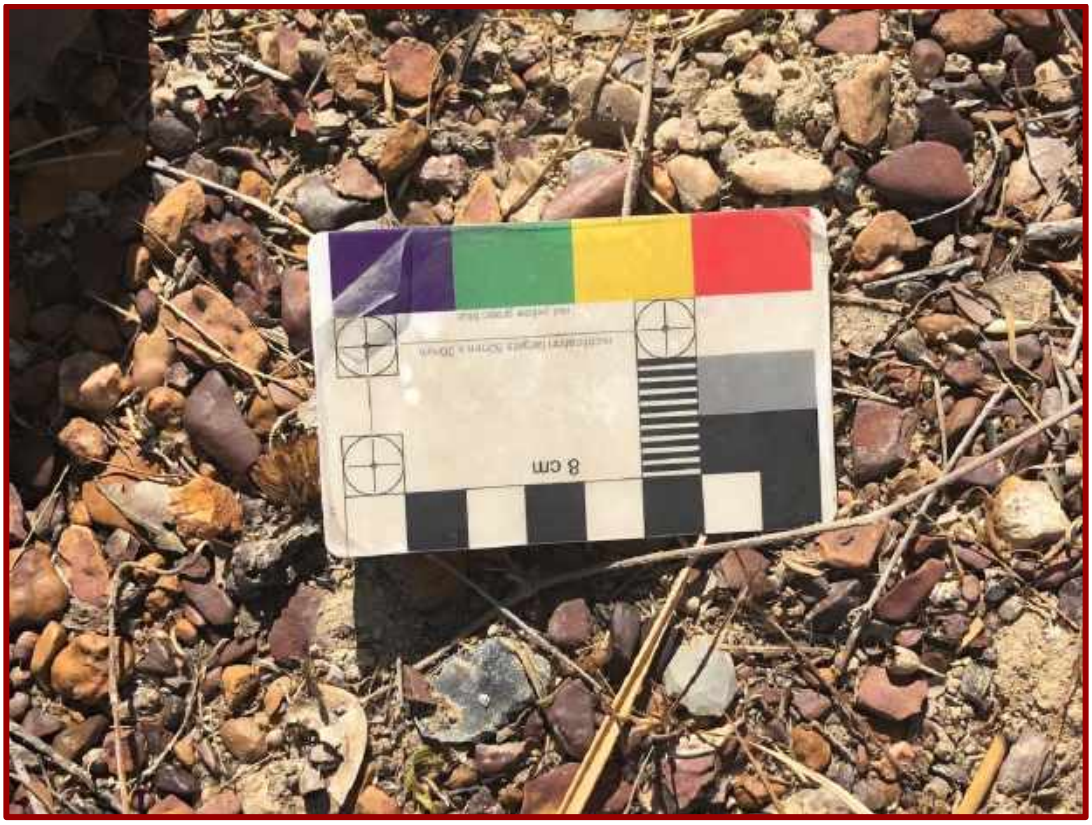


Figure 25, a-b: Tuff and quartz artefacts, including unifacial point

6.2 Haul road – northern section

The survey team identified 14 archaeological features in the area of haul road planned between Iron Blow and Fountain Head. This included 3 Aboriginal objects, 5 Aboriginal places, 3 combined Aboriginal and historical places, one historical object, one historical place and one recent historical place. The *Heritage Act* presumptively protects the Aboriginal places and objects. None of the historical places or objects are declared heritage places / objects under the Act, and therefore are not legally protected.

These survey results are summarised in Table 3, below, and their locations mapped in Figure 26.

Table 3: Summary of results – northern haul road area

Site Name	Site Type	Easting	Northing
201910231015	Aboriginal object	776098	8505791
201910210830	Aboriginal object	775880	8504955
201910210840	Aboriginal object	775906	8504959
201910230953	Aboriginal place	776154	8505635
201910231010	Aboriginal place	776034	8505714
201910231020	Aboriginal place	776074	8505881
201910210845	Aboriginal place	775975	8504971
201910210900	Aboriginal place	775999	8504962
201910211450	Aboriginal place and historical place	776237	8505308
201910210945	Aboriginal place and historical place	776054	8504798
201910211210	Aboriginal place and historical place	776122	8508136
201910210905	Historical Object	776010	8504969
201910191130	Historical place	776130	8506638
201910211235	Recent historical place	776022	8506232

In general, the sites in this area reflect similar priorities for both Indigenous and Western occupation periods – resource extraction, plus associated evidence of the lives of people who lived and worked in the area. A series of sites on the low hills between the ridgeline and the haul road are quarry and reduction sites of varying density. These Aboriginal places and objects provide evidence for the extraction and working of raw materials for a variety of tool types. A cluster of sites in the northwest corner of the Iron Blow area includes historical and Aboriginal places and objects. The Aboriginal stone artefacts include bipolar percussed blades – a relatively uncommon manufacturing technique used to maximize the use of the resource.

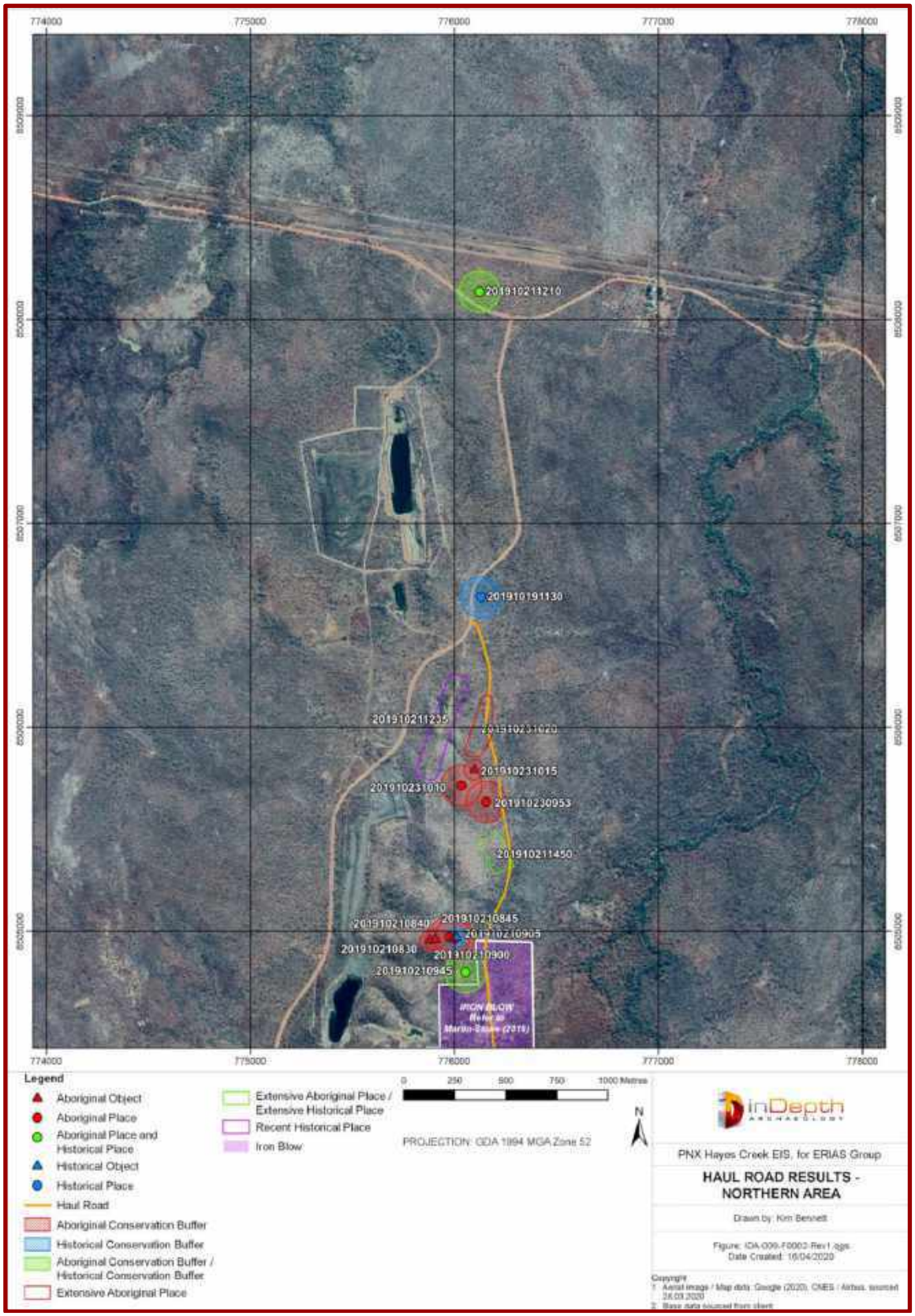


Figure 26: Survey results, northern haul road area

6.2.1 Aboriginal object 201910231015

Location: 776098E, 8505791N
Condition: Not recorded
Description:
Tuff blade, proximal and distal breaks. Isolated artefact in washout between hills that have quarry sites on them.

Figure 27, a-b: Front and back view of tuff blade

6.2.2 Aboriginal object 201910210830

Location: 775880E, 8504955N
Condition: Poor – very disturbed by heavy machinery and fossickers
Description:
Three flaked artefacts in area that was probably a site, but has been heavily disturbed. Two aluminium pegs present. Recorded in 100% visibility. Two flakes and one flaked piece, all of tuff, no retouch.

Figure 28, a-b: Flake, flaked piece

6.2.3 Aboriginal object 201910210840

Location: 775906E, 8504959N
Condition: Not recorded
Description:
Isolated artefact. Flaked piece, tuff, no retouch.

Figure 29: Tuff flaked piece

6.2.4 Aboriginal place 201910230953

Location: 776154E, 8505635N
Condition: Fair to poor – dug over by fossickers
Description:
Quarry site of 1,000+ artefacts, maximum density 30/m^2. Feldspathic metagreywacke raw material. Artefact types include axe blanks, blade cores, flaked pieces, whole flake, broken flake, core. Visibility 50-100%. Artefacts clustered and scattered.

Figure 30, a-b: Site context

Figure 31, a-b: Feldspathic metagreywacke artefacts and quarrying source

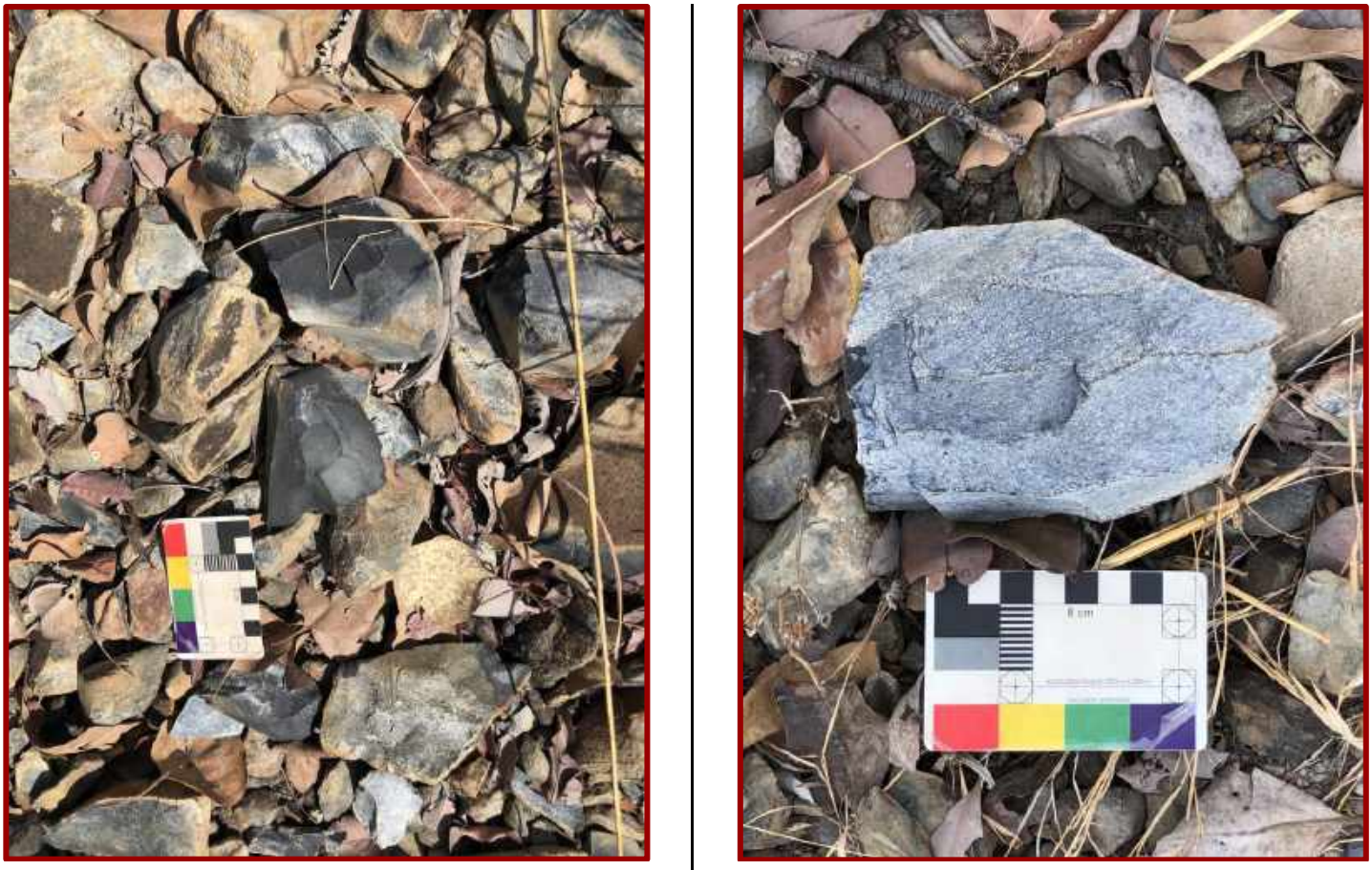


Figure 32, a-b: Quarried cores, blade blank

6.2.5 Aboriginal place 201910231010

Location: 776034E, 8505714N
Condition: Fair to poor – dug over by fossickers
Description:
Quarry and reduction site, uphill from site 201910230953. Bifacial points, bifacial blanks, unifacial pre-form, flakes, flaked pieces, 500+ artefacts. Slopes dug over by fossickers. Artefacts continue down NE slope.

Figure 33: Site context

Figure 34, a-c: Bifacial point (front and back), site context

Figure 35: Artefact density

Figure 36, a-b: Bifacial point pre-form, axe pre-form

6.2.6 Aboriginal place 201910231020

Location: 776074E, 8505881N
Condition: Fair to poor – heavy machinery and fossicker disturbance
Description:
Low density artefact scatter, possibly quarry. On hill nearby to previously recorded sites – seems to be a continuous area used for quarrying and manufacture of artefacts. Disturbed by heavy machinery and fossickers. Site continues onto the flat area downslope - needs more survey, due to limited time in extreme heat.

Figure 37: Site context

Figure 38, a-b: Blade

Figure 39, a-b: Green bottle glass, artefact density

6.2.7 Aboriginal place 201910210845

Location: 775975E, 8504971N
Condition: Good
Description:
Low density artefact scatter on flat area, down from the top of the ridge. 10+ artefacts, all tuff. Flake, broken flake, flaked piece, blade and one perfect unifacial point.

Figure 40: Site context

Figure 41, a-b: Unifacial point, flake

6.2.8 Aboriginal place 201910210900

Location: 775999E, 8504962N
Condition: Good
Description:
Very low density artefact scatter across ridge. Perfect bifacial point and broken retouched flake, both tuff.

Figure 42, a-b: Bifacial point, front and back

Figure 43, a-b: Broken core

6.2.9 Aboriginal and historical place 201910211450

Location: 776237E, 8505308N
Condition: Good to fair – heavy machinery, fossickers
Description:
Stone artefact scatter across low rise and adjacent hill. Highest density on hill - knapping floors. Glass artefacts (<10), including Holbrook & Co glass bottle stopper. Green, clear and blue glass all present. Recorded in 60-100% visibility. Artefacts are both clustered and scattered. 2000+ artefacts in total, of stone, metal and glass. Stone is all tuff. Stone artefact types include whole flake, retouched flake, broken flake, flaked piece, axe, hammer stone, blade, unifacial point, bifacial point, debitage.

Figure 44: Site context

Figure 45, a-b: Site context, broken hammer stone

Figure 46, a-b: Artefact density, unifacial point

Figure 47, a-b: Flaked piece, bifacial point pre-form

Figure 48, a-d: Broken bifacial point (front and back), Holbrook & Co glass bottle stopper (top and side)

Figure 49, a-b: Broken axe pre-form, artefact density

6.2.10 Aboriginal and historical place 201910210945

Location: 776054E, 8504798N
Condition: Poor – heavy machinery, fossickers / metal detectorists, feral animals
Description:
Low gravelly ridge, with track around base. Highly disturbed. Historical and Indigenous site. Corrugated iron, 19th C glass, iron boot heel, tiny horseshoe? Some stone artefacts broken and retouched. Bipolar percussed blade, whole flake, retouched flake, broken flake, flaked piece, core, blade, unifacial point, green glass, blue glass, purple glass, clear glass, metal.

Figure 50: Site context

Figure 51, a-b: Site context

Figure 52, a-b: Site context, boot heel

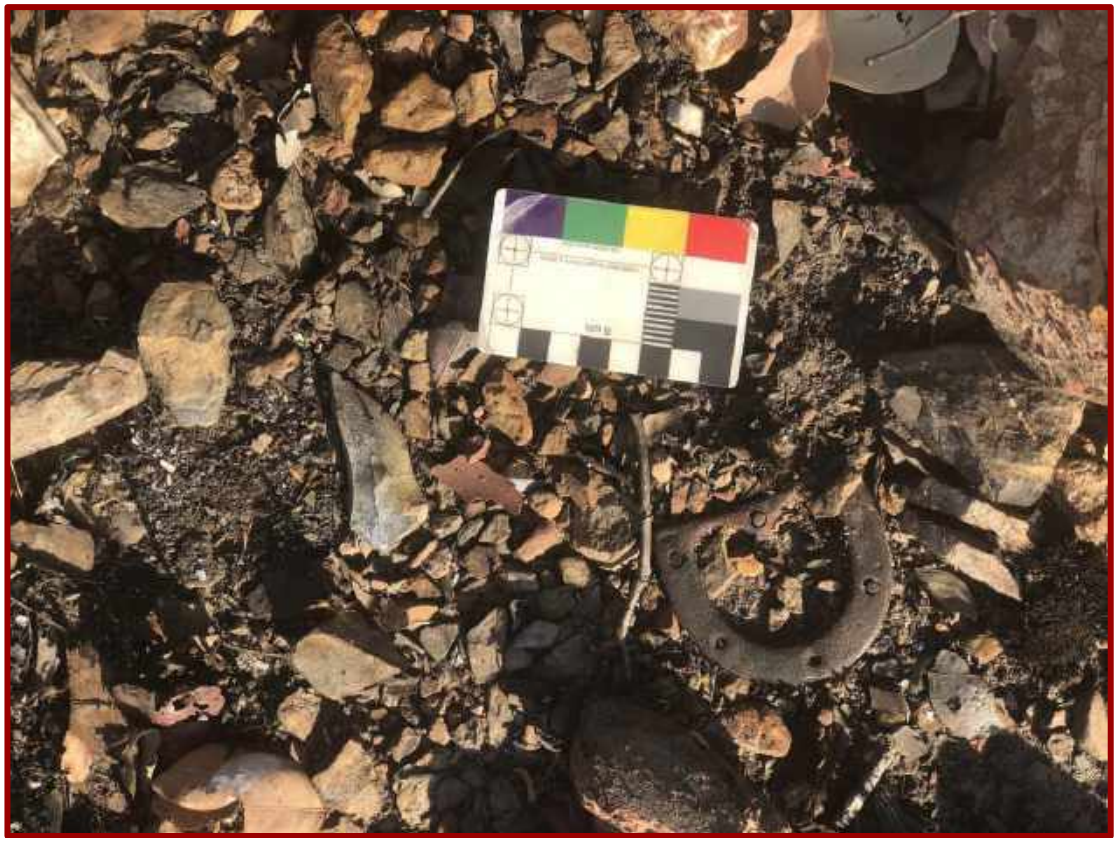


Figure 53, a-b: Artefact density, blade

Figure 54, a-b: Blue bottle glass, boot heel or tiny horseshoe

6.2.11 Aboriginal and historical place 201910211210

Location: 776122E, 8508136N
Condition: Fair – heavy machinery, fossickers, feral animals
Description:
Near the intersection of the Grove Hill Rd with the Mount Wells Rd, this site is a combined historical and Aboriginal place on a small hill. No evidence of built structures was located. The historical artefacts include a range of raw materials (glass, metal, ceramic). The Aboriginal stone artefacts include broken flake, flaked piece, and points. Quartz bifacial point, tuff unifacial point, 98% tuff raw material, 100+ artefacts. Artefacts are both clustered and scattered. Historical artefacts of metal, glass (green, blue) and ceramic (earthenware). This diversity in the artefact assemblage indicates use of the site for broad purposes of general occupation.

Figure 55: Site context

Figure 56, a-b: Bifacial point, clear bottle glass round base

Figure 57, a-b: Clear bottle glass hexagonal base, flaked piece and earthenware ceramic sherd

Figure 58, a-b: Quartz bifacial point, site context

6.2.12 Historical object 201910210905

Location: 776010E, 8504969N
Condition: Good
Description:
Stone arrangement (historical), in a V-shape like a claim peg location.

Figure 59: V-shaped stone arrangement

6.2.13 Historical place 201910191130

Location: 776130E, 8506638N
Condition: Poor – fossickers / detectorists, feral animals, heavy machinery
Description:
Historical bottle dump near the intersection of the Grove Hill Rd and the haul road alignment through Iron Blow. Artefacts are 95% brown glass, so probably mid-20th C or later. 20L metal drum, metal box. Bottle stamps include R43, plus many others. The dump is under a shady milkwood tree at the junction of tracks, so may have been used as a regular meeting place in recent historical times. Approximately 150+ artefacts, of metal and glass. No stone artefacts observed.

Figure 60, a-b: Site context and detail

6.2.14 Recent historical place 201910211235

Location: 776022E, 8506232N
Condition: Destroyed
Description:
This site comprises a series of concrete slabs and evidence of mining activity from the recent historical period. One stone artefact (tuff flaked piece) was found in this area, however this ridgeline may have previously been an Aboriginal site, due to its similarity to similar site contexts nearby. The extensive disturbance from recent mining activities has destroyed any potential in situ evidence of this. 4x concrete slabs along a ridge top, including three close together. One looks like a tank, and there's a corrugated tank downhill from it, near diggings. One slab has machinery footings and rusted metal objects (location of battery?). The hilltop is highly disturbed, including a mine pit. Some ceramic sherds were located. One concrete slab has "Avoid" painted on it in blue.

Figure 61: One of the concrete slabs on the ridgeline

Figure 62, a-b: Further concrete slabs and evidence of disturbance

Figure 63: Writing on one of the slabs

Figure 64, a-b: Small finds

Figure 65, a-b: Metal artefacts, including washing machine parts

6.3 Haul road – southern section

The survey area south of Iron Blow includes the original location of the Grove Hill settlement, and the Port Darwin Camp Cemetery and associated sites. It also includes extensive evidence of Aboriginal occupation of the area, prior to Western arrival. The evidence from the Grove Hill settlement site shows Indigenous people using Western materials during the 'contact period,' knapping glass in the manner of their stone tool manufacture. Newspaper accounts of the day record Indigenous people performing corroborees at Port Darwin Camp for visiting dignitaries. Most of the Indigneous people wore no clothing aside from two women and the 'King'. The account also records an instance of a young Indigenous woman traveling with a drover as his 'servant,' and describes massacres of Indigenous people resulting from disputes over women (South Australian Register, Thursday 13 April 1882, pp.5-6), though it doesn't detail local atrocities. The documentary and archaeological evidence are crucial for developing a deeper understanding of the experience of Warai and Wagiman people during this critical time in Northern Territory history.

The survey team identified 10 archaeological features in this part of the project area. These features included 2 Aboriginal places, 4 historical places, 3 combined Aboriginal and historic places, and one isolated historical object. The *Heritage Act* presumptively protects the Aboriginal places and objects. None of the historical places or objects are declared heritage places / objects under the Act, and therefore are not legally protected. However, in most cases their significance according to the criteria of the Act warrants their preservation (see Section 7).

These survey results are summarised in Table 4, below, and their locations mapped in Figure 66.

Table 4: Summary of results - southern haul road area

Site Name	Site Type	Easting	Northing
201910191340	Aboriginal place	775575	8501928
201910200820	Aboriginal place	775313	8502488
201910201005	Aboriginal place and historical place	775956	8503088
201910201115	Aboriginal place and Historical place	776508	8503784
201910191515	Aboriginal place and historical place	775538	8502746
201910201015	Historical Object	775956	8503171
GRAVE	Historical place	775446	8502813
SIGNAGE	Historical place	775447	8502843
201910200845	Historical place	775422	8502569
201910200945	Historical place	775802	8503082

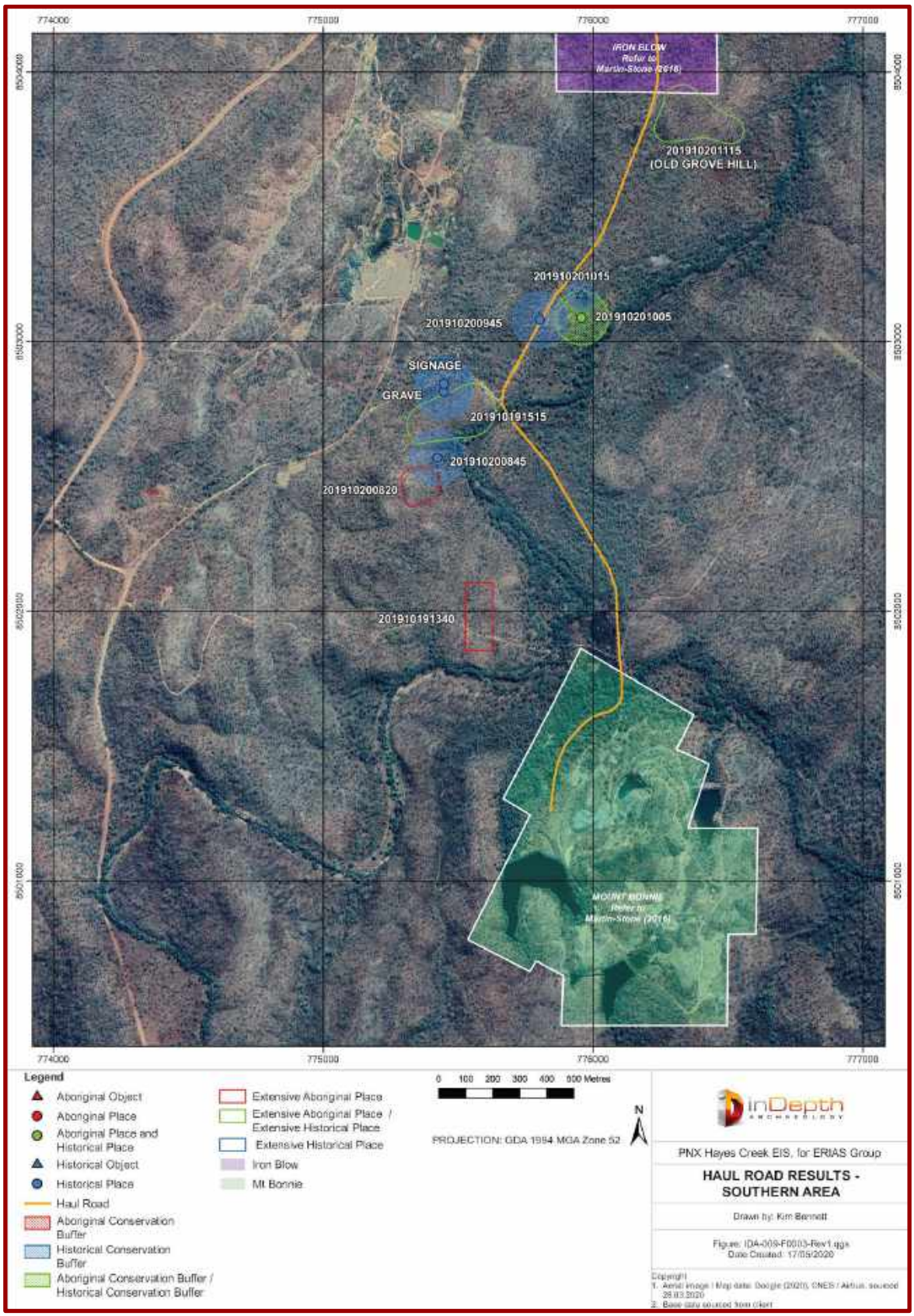


Figure 66: survey results, southern haul road area

6.3.1 Aboriginal place 201910191340

Location: 775575E, 8501928N
Condition: Good – bulldozed track across ridge
Description:
This site was recorded in very good visibility (80-100%), and extends along the ridgeline with 360-degree views of the surrounding landscape including Mount Bonnie. Despite the bulldozed track through the site and some heavy machinery disturbance on the lower eastern slopes, the site has suffered relatively little disturbance. It is a large stone artefact scatter across the ridge top and slopes, with diverse artefacts and raw materials. It contains approximately 2,000+ clustered and scattered artefacts of quartz, tuff and hornfels. Artefacts are flaked, ground and quarried, including whole flake, retouched flake, broken flake, flaked piece, core, axe, grindstone, hammer stone, blade, unifacial point, bifacial point and debitage.

Figure 67: Site context

Figure 68, a-b: Site context, and broken axe

Figure 69, a-b: Site context, including large grindstones pointed out by the Traditional Owners

Figure 70, a-b: Quarried and ground stone, and site context

Figure 71, a-b: Broken hammer stone, and view of Mount Bonnie

Figure 72, a-b: Blade pre-form, front and back

Figure 73: Tuff and quartz artefacts

6.3.2 Aboriginal place 201910200820

Location: 775313E, 8502488N
Condition: Good – heavy machinery disturbance on lower slopes, metal detectorists, feral animals
Description:
This site was recorded in conditions of low visibility, and has a high probability of being more extensive than was immediately evident. It is a stone artefact scatter on flat area halfway up slope. It is on the second hill back from Margaret River, with salmon gums and spear grass. Over 25 artefacts were recorded (stone - all tuff), scattered. Artefact types include whole flake, broken flake, flaked piece, and bifacial point. Site faces NE-E.

Figure 74: Zero visibility in most parts of the site

Figure 75, a-c: Artefacts and site context in areas of higher visibility

6.3.3 Aboriginal and historical place 201910201005

Location: 775956E, 8503088N
Condition: Poor to destroyed
Description:
Low density artefact scatter on low rise west of river. The team identified a grindstone with two circular grinding hollows. Circular grinding hollows generally indicate grinding ochre for paint, whereas long oval grinding hollows indicate processing seeds or grains for flour.

Historical artefacts were also located in the area, and an old road (disused track) between the site and the river. The site has been extensively disturbed by heavy machinery and historical occupation of an Indigenous site. Artefacts are stone, metal and glass, scattered - approximately 30+ artefacts in total. All stone artefacts are tuff, aside from the grindstone. Artefact types include whole flake, broken flake, flaked piece, grindstone. Recorded in 85% visibility.

Figure 76: Grindstone (broken) with two circular grinding hollows

Figure 77, a-b: Evidence of destruction in the site

Figure 78, a-c: Metal boot heel (front and back), and stone and glass artefacts

Figure 79: Horseshoe

6.3.4 Aboriginal and historical place 201910201115 (Old Grove Hill)

Location: 776508E, 8503784N
Condition: Fair – fossickers and feral animals
Description:
The original Grove Hill settlement site is located on a series of hills at the southern edge of the Iron Blow lease boundary. The exact date the settlement commenced is not clear, though it would have been sometime between 1873 and 1882 (Jones, 1987). Grove Hill was moved to the present site on the railway line in 1935. The consultant recorded part of the original settlement site in 2016 (Martin-Stone, 2016 – see Appendix A), however the majority lay outside of that defined project area and was recorded in this 2019 survey. The site includes the foundations of four buildings, a rubbish dump which appears quite useful for understanding daily life in the settlement, various areas of concentrated density of stone artefacts, and other material remains. Compared to other sites nearby, it appears to have been less disturbed by fossickers. The site was recorded in extreme heat of approximately 44 degrees, which hampered the ability of the team to record it in detail and caused digital equipment to shut down.

The site includes artefacts that show concurrent Indigenous and Western occupation – glass bottle bases that have been knapped for the manufacture of glass tools the same way stone was traditionally knapped, and a metal shovel-nosed spearhead. A more detailed analysis of the site may provide further evidence of the way people interacted during this 'contact period' of history, including gaining a more nuanced understanding of the way Indigenous people adapted to the presence of Westerners on their country. Given that history is written 'by the victors,' this site has the potential to demonstrate the histories of Indigenous people that weren't adequately documented in the past.

The site is a stone artefact scatter (Indigenous occupation site) and original built settlement for Iron Blow / Grove Hill. It overlooks Margaret River. The team observed approximately 1,000+ artefacts, including 4x flaked glass cores (green, purple, colourless) and a metal speahead. Four building foundations, a rubbish dump and other material remains are spread across the hilltops and down some of the slopes. Artefacts are clustered and scattered. Materials include stone, metal, glass, and ceramic (earthenware and fine). Stone artefacts are all tuff, including whole flake, broken flake, flaked piece, core, blade, and unifacial point. The site was recorded in 80-100% visibility, but extreme heat which affected technology and team members. The site includes a dump (776417E, 8503809N), a stone pile (776430E, 8503824N), a large building (776457E, 8503806N), areas of greater density of stone artefacts (776323E, 8503879N and 776311E, 8503873N), notable bottles (776313E, 8503898N) and bricks (776335E, 8503904N).

Figure 80, a-b: Site context looking towards the river, and across the foundations of largest building

Figure 81, a-b: Clear and purple bottle bases, knapped according to Aboriginal tradition, to flake glass tools

Figure 82, a-b: Artefact density, and metal spearhead

Figure 83, a-b: Site context, including rubbish dump (above)

Figure 84, a-b: Metal door hinge, and green glass bottle base showing evidence of Aboriginal knapping

Figure 85, a-b: Green glass bottle base knapped using blade knapping technique, earthenware ceramics and glass artefacts

6.3.5 Aboriginal and historical place 201910191515

Location: 775538E, 8502746N
Condition: Good – heavy machinery and metal detectorists (including in the last few days)
Description:
Immediately south of the Port Darwin Camp cemetery, the survey team recorded this extensive combined Aboriginal and historical place. It covers the hill to the immediate southeast of the grave and signage (adjacent to the current river crossing), and the saddle immediately south. There is a high probability that the site extends onto the hill to the immediate southwest, however vegetation growth resulted in zero surface visibility of that hill.

This site was recorded in very low visibility (0-20%), and the team documented approximately 1,200+ artefacts of stone, metal, glass and ceramic. There is a high probability of more artefacts being present in the site. The artefacts included two non-portable grindstones showing extensive use wear, located at 775428E, 8502742N and 775425E, 8502732N. The extent of use wear on the grindstones indicates intensive occupation by Indigenous people, or occupation over a long period of time, or both. As the site contains aggrading sediment including alluvial deposit, there is a high potential for subsurface archaeological remains.

Artefacts include thick green glass bottles (19th Century), square gin glass, flattened tin, non-portable grindstones and other stone artefacts. The team observed over 200 artefacts, of stone, metal and

glass, in the saddle, and over 1,000 artefacts on the ridge top and the lower flat area between the hilltop and the cemetery (stone, glass and ceramic). Total number of artefacts in both areas is predicted to be much higher. Stone artefacts are tuff and quartz, and include whole flake, retouched flake, broken flake, flaked piece, grindstone, hammer stone, blade, unifacial point and bifacial point.

Figure 86: Site context, showing lack of visibility

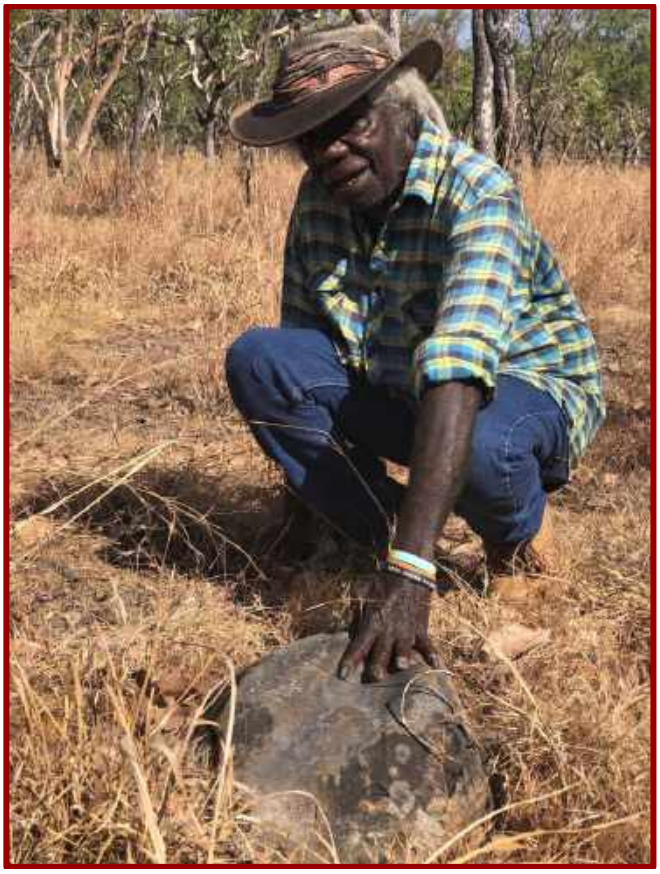


Figure 87, a-c: George Huddlestone Jabulgarri with one of the non-portable grindstones, showing extensive use wear

Figure 88, a-d: broken unifacial point, broken bifacial point, artefact density, and green glass bottle base

6.3.6 Historical object 201910201015

Location: 775956E, 8503171N
Condition: Not recorded
Description:
Large metal ring / dish, partially embedded in the ground. Approximately 1.2m in diameter, 1cm thick iron. Possibly a wagon wheel strap?

Figure 89: Phillip Goodman and George Huddlestone Jabulgarri with the large metal ring

6.3.7 Historical place GRAVE

Location: 775446E, 8502813N
Condition: Good
Description:
The gravestone of William Knight Hay is the only visible remnant remaining from the old Port Darwin Camp Cemetery. Hay was a butcher and stock dealer who ran businesses in Palmerston (Darwin) and Port Darwin Camp (*The North Australian*, 7 Aug 1885, p.2). He died in 1885. Relatives in Queensland and Northern Territory friends erected his headstone. Port Darwin Camp cemetery was the resting place for Western and Asian members of the local community, from 1874-1899. Records located to date only document interments from 1879-1889, so the potential for additional burials is high. Thirty burials are recorded in the cemetery (Australian Cemeteries website, accessed 15 April 2020). The boundaries of the site are not defined, and the location of the other burials is unclear. The potential exists for burials to be located in any direction from the location of the single headstone, including under or beyond the present track, where the vehicle is parked in the photos.

Figure 90, a-b: Port Darwin Camp cemetery

Figure 91: Grave of William Knight Hay, in Port Darwin Camp cemetery

6.3.8 Historical place SIGNAGE

Location: 775447E, 8502843N
Condition: Not recorded
Description:
Interpretive signage erected to mark the Port Darwin Camp cemetery. The combined efforts of the National Trust, Northern Territory Government (NTG, and Genealogical Society of the NT (GSNT) are evident in the signage. The site is No. 26 on the National Trust register, which does not confer legal protection. The known burials are listed resulting from research conducted by the GSNT. The first five years of records of the cemetery have not been located.

Figure 92: Phillip and George at the Port Darwin Camp cemetery signage, with the grave of William Knight Hay visible in the background

Figure 93, a-b: Signage at Port Darwin Camp cemetery, including a list of names of the known deceased

6.3.9 Historical place 201910200845

Location: 775422E, 8502569N
Condition: Not recorded
Description:
6x shallow adits (mine diggings). Very low visibility, so no artefacts observed. Adjacent to creek, near river.

Figure 94: Site context

Figure 95, a-b: Adits

6.3.10 Historical place 201910200945

Location: 775802E, 8503082N
Condition: Destroyed – heavy machinery
Description:
Concrete slabs and red brick, bulldozed either side of current track. Artefacts (historical) are clustered and scattered, and are made of metal, glass, brick and concrete. Approximately 200+ artefacts. Recorded in 80%-100% visibility.

Figure 96, a-b: Remnants of destroyed site along current track

Figure 97: Remains of disturbed bricks and mortar

7.0 Significance Assessment

7.1 Significance assessment

The assessment of significance of archaeological places and objects is mandated by the *Heritage Act* 2012 and is a highly useful tool in making decisions regarding the management of cultural heritage.

The heritage assessment criteria for a place or object are as follows, under Section 11 of the *Heritage Act*:

- (a) whether it is important to the course, or pattern, of the Territory's cultural or natural history;
- (b) whether it possesses uncommon, rare or endangered aspects of the Territory's cultural or natural history;
- (c) whether it has potential to yield information that will contribute to an understanding of the Territory's cultural or natural history;
- (d) whether it is important in demonstrating the principal characteristics of a class of cultural or natural places or environments;
- (e) whether it is important in exhibiting particular aesthetic characteristics;
- (f) whether it is important in demonstrating a high degree of creative or technical achievement during a particular period;
- (g) whether it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons, including the significance of a place to Aboriginal people as part of their continuing and developing cultural traditions; or
- (h) whether it has a special association with the life or works of a person, or group of persons, of importance in the Territory's history.

All archaeological places and objects recorded during the course of surveys are assessed for their significance according to these criteria.

This report separates the significance into two types: archaeological significance and cultural significance. Archaeological significance is assessed against criteria 11(a)-(f) and 11(h). Cultural significance is assessed against criterion 11(g).

Cultural significance to Traditional Owners is recorded through consultation with Traditional Owner representatives during the survey. Where the cultural history of a site is not limited to Indigenous heritage, cultural significance can be assessed in dialogue with the relevant descendant community. This social impact assessment was beyond the scope of the current survey, so cultural significance to non-Indigenous stakeholder groups was not assessed. In some cases, it can be reasonably inferred, eg. regarding burials and cemeteries.

Sometimes cultural significance and the archaeological significance assessment differ, and the management recommendation takes into account both kinds of significance. The consultant has also assessed the degree of significance, to enable more nuanced, site-specific management recommendations. Places and objects were rated low significance, moderate significance or high significance. This rating takes into account:

- the current condition of the place / object,
- the degree to which further analysis would contribute to our knowledge of the place / object (or its class of place / object throughout the Northern Territory), and

- whether it fits multiple significance criteria and exhibits a high degree of heritage value according to these criteria.

The summary of significance of places and objects recorded during the current survey can be found in Table 5. The outcome of this significance assessment is a clear view of how the archaeological resources compares to the proposed project footprint. The significant archaeological resource is mapped in Figure 98. Large scale maps for each area are included in Section 7.2 below.

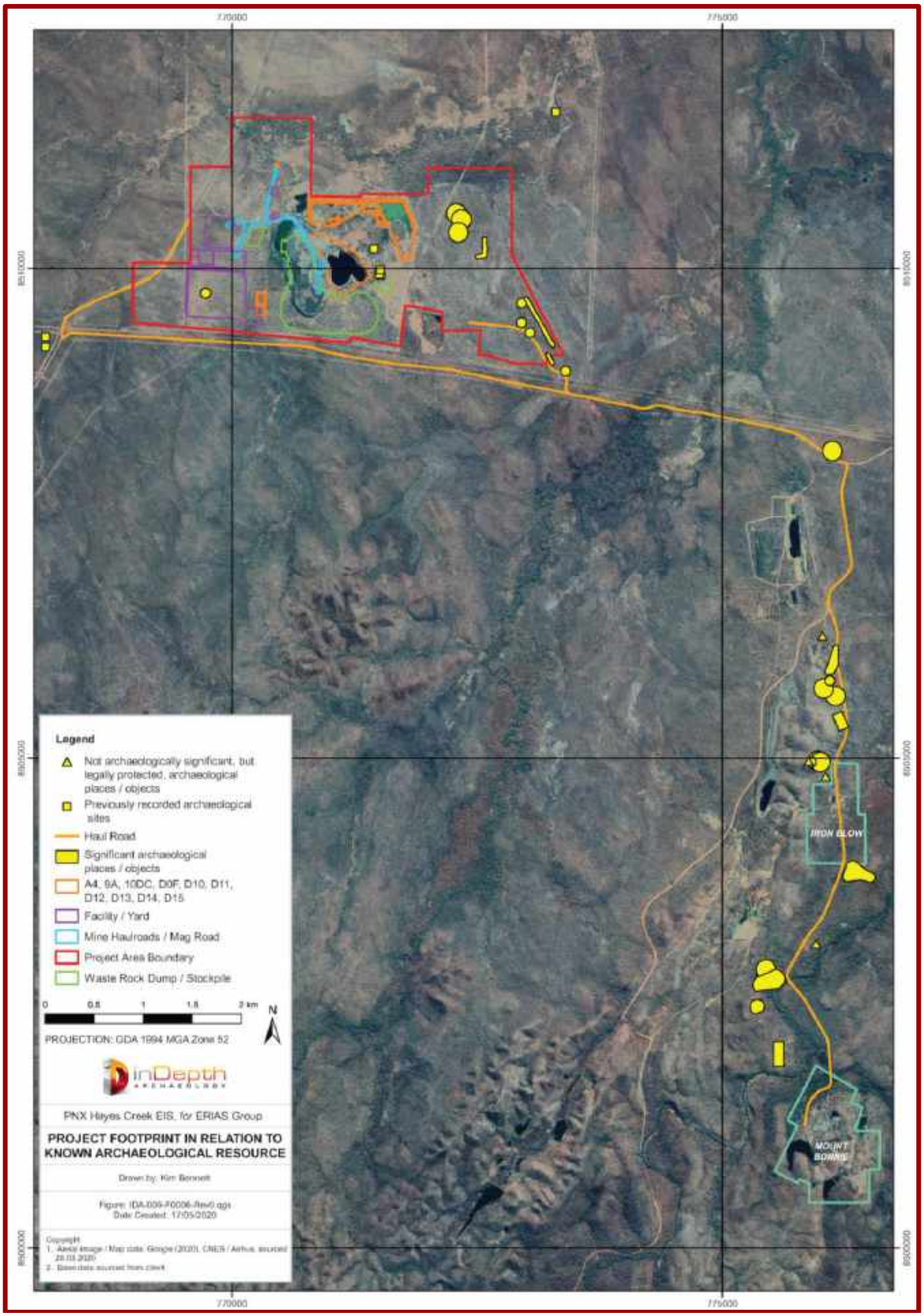


Figure 98: Defined significant archaeological resource in relation to the proposed project footprint

Table 5: Summary of significance assessment of heritage places and objects

Site ID	Site type	Easting	Northing	Condition	Cultural significance	Archaeological significance	Management Recommendation
FOUNTAIN HEAD							
201910220850	Aboriginal object	773401	8508951	Moderate visibility. Disturbance: grazing stock	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221030	Aboriginal object	772954	8509645	Good	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221040	Aboriginal object	772952	8509447	Not recorded	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221045	Aboriginal object	773040	8509343	Not recorded	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221220	Aboriginal object	769730	8509747	Not recorded	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221500	Aboriginal place	772286	8510563	Not recorded	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221510	Aboriginal place	772339	8510499	Not recorded	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit

							under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221515	Aboriginal place	772308	8510368	Good - in situ. Disturbance factors: grazing stock.	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910220900	Aboriginal place	773266	8509032	Good - in situ. Disturbance factor: grazing stock.	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910220945	Aboriginal place	773275	8509213	Good - in situ. Disturbance factor: grazing stock.	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
21910221545	Aboriginal place	772580	8510129	Good - in situ. Disturbance factor: grazing stock.	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
NORTHERN HAUL ROAD AREA							
201910231015	Aboriginal object	776098	8505791		Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910210830	Aboriginal object	775880	8504955	Poor - very disturbed by	Significant	Not significant due to poor site	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under

				heavy machinery and fossickers		condition.	the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910210840	Aboriginal object	775906	8504959		Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910230953	Aboriginal place	776154	8505635	Fair to poor - dug over by fossickers	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910231010	Aboriginal place	776034	8505714	Fair to poor - dug over by fossickers	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910231020	Aboriginal place	776074	8505881	Fair to poor - heavy machinery and fossicker disturbance	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Conduct more detailed survey prior to any works in the area. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210845	Aboriginal place	775975	8504971	Good	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210900	Aboriginal place	775999	8504962	Good	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.

201910211450	Aboriginal place and historical place	776237	8505308	Good to fair - heavy machinery, fossickers	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210945	Aboriginal place and historical place	776054	8504798	Poor - heavy machinery, fossickers / metal detectorists, feral animals	Significant	Not significant due to poor site condition.	Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910211210	Aboriginal place and historical place	776122	8508136	Fair - heavy machinery, fossickers, feral animals	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210905	Historical Object	776010	8504969	Good	Not assessed	Not significant	Object is not legally protected or significant. Works may proceed in this area.
201910191130	Historical place	776130	8506638	Poor - fossickers / detectorists, buffalo, donkeys, heavy machinery	Not assessed	Not significant due to poor site condition.	Site is not legally protected or significant. Works may proceed in this area.
201910211235	Recent historical place	776022	8506232		Not assessed	Not significant	Site is not legally protected or significant, aside from single Aboriginal stone artefact identified. Works may proceed in this area if necessary, with permit to disturb isolated artefact.
SOUTHERN HAUL ROAD AREA							
201910191340	Aboriginal place	775575	8501928	Good - bulldozed track across ridge	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910200820	Aboriginal place	775313	8502488	Good - heavy machinery	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left

				disturbance on lower slopes, metal detectorists, feral animals			undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910201005	Aboriginal place and historical place	775956	8503088	Poor to destroyed	Significant	Not significant due to poor site condition.	Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910201115	Aboriginal place and Historical place	776508	8503784	Fair - fossickers and feral animals	Significant	Highly significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed, and undertake further archaeological investigation if possible.
201910191515	Aboriginal place and historical place	775538	8502746	Good - heavy machinery and metal detectorists (including in the last few days)	Significant	Highly significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed, and undertake further archaeological investigation of the westernmost hill in conditions of better visibility, to properly document the site boundary.
201910201015	Historical Object	775956	8503171		Not assessed	Not significant	Object is not legally protected or significant. Works may proceed in this area.
GRAVE	Historical place	775446	8502813		Significant	Highly significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. Geophysical investigation to define the boundaries of the cemetery, and further historical and archaeological research, would be necessary to develop appropriate management measures for the cemetery.
SIGNAGE	Historical place	775447	8502843		Significant	Significant	Recommended to be left undisturbed. While not technically part of the historical fabric of the cemetery, this signage represents community efforts to recognise and interpret heritage places in remote areas. If it is necessary to disturb the signage, it should be replaced with updated equivalent interpretive materials.
201910200845	Historical place	775422	8502569		Not assessed	Not significant	Site is not legally protected or significant. Works may proceed in this area.

201910200945	Historical place	775802	8503082	Destroyed - heavy machinery	Not assessed	Not significant	Site is not legally protected or significant. Works may proceed in this area.

7.2 Discussion of significance assessment

This section of the report discusses how significance was assessed according to each archaeological feature type, with direct reference to the assessment criteria, described in Section 8.1. Where there are exceptions to these general assessments for specific features, reasons for this are detailed. The significant archaeological resource is mapped against the proposed project footprint in Figures 99-101, following the discussion below.

Aboriginal objects

The stone artefacts recorded as isolated Aboriginal objects in the survey results are generally significant according to the following criteria under Section 11 of the *Heritage Act* (2012):

- Criterion (a): they are important to the course, or pattern, of the Territory's cultural history. The background scatter of stone tools across the landscape tell us about the technology, the use and discard patterns of everyday objects and, by extension, patterns in Aboriginal life across millennia.
- Criterion (c): they have the potential to yield information that contributes to an understanding of the Territory's cultural history.
- Criterion (e): individually they may exhibit particular aesthetic characteristics. Most commonly, bifacial points, unifacial points, Kimberley points and axes meet this criterion.
- Criterion (f): individually they may demonstrate a high degree of creative or technical achievement during a particular period.
- Criterion (g): they have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. The Traditional Owners confirmed this cultural significance.

While the Aboriginal objects documented in this report are recognised as having cultural significance, their archaeological significance is considered low, as little further information can be obtained beyond what is documented in this report. These objects remain protected by the Act, so disturbance may only be authorised with appropriate permits. It is recommended that any such disturbance is undertaken in full consultation with the Traditional Owners, particularly with regard to the long term custody and care of the artefacts.

Aboriginal object 201910210830 is not considered significant due to poor site condition removing it from its original context.

Aboriginal places

The survey documented stone artefact scatters that comprised occupation, quarry and reduction sites. These sites are generally significant according to the following criteria under Section 11 of the *Heritage Act* (2012):

- Criterion (a): they are important to the course, or pattern, of the Territory's cultural history. The patterning of sites across the landscape tells us about the technology, the use and discard patterns of everyday objects and, by extension, patterns in Aboriginal life across millennia.
- Criterion (c): they have the potential to yield information that contributes to an understanding of the Territory's cultural history.
- Criterion (f): they may demonstrate a high degree of creative or technical achievement during a particular period, for example in techniques of quarrying, or in the introduction of bipolar percussion as a method of conserving a resource.

- Criterion (g): they have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. The Traditional Owners confirmed this cultural significance.

The occupation, quarry and manufacture sites have both cultural and archaeological significance. They have the potential to inform our understanding of Indigenous resource use across the landscape. They are important to the course of the Northern Territory's cultural history and have the potential to contribute further to our understanding of this cultural history, by providing insight into the manufacturing, trade and of artefacts from the region. Initial assessments of sites in the region show evidence for a manufacturing tradition on an industrial scale and trade across vast distances, at odds with the common erroneous assumption of Aboriginal economy as local subsistence (Martin-Stone & Woolfe, 2013).

No exceptions to this significance assessment were observed for Aboriginal places.

Aboriginal and historical places (combined)

Six combined Aboriginal and historical places were documented in the survey. In some instances, these appear to be historical places that were established on top of existing Aboriginal places. In others, there is evidence that both Indigenous and coloniser communities occupied the sites at the same time. The Aboriginal heritage values in each of these sites generally meet the same criteria as outlined above for Aboriginal places and are assessed as significant under the Act. Additionally, the sites with evidence of shared occupation meet criterion (b), possessing uncommon, rare or endangered aspects of the Territory's cultural history. However, two of the combined Aboriginal and historical places (201910201005 and 201910210945) have experienced such extensive disturbance that they are deemed not significant due to the destruction and loss of site context.

The historical aspects of the remaining four sites were separately assessed against the criteria. Sites 201910211450 and 201910211210 are not assessed as meeting the criteria for significance from a historical perspective, however they are both assessed as significant for their Aboriginal heritage value.

The site of the original Grove Hill settlement (201910201115) is deemed particularly significant for both its Aboriginal and historical values. It meets the following criteria under the Act:

- Criterion (a): it is important to the course, or pattern, of the Territory's cultural history. It demonstrates the shared experience of Indigenous and coloniser communities, reflecting a critical time of change in our history.
- Criterion (b): it possesses uncommon, rare or endangered aspects of the Territory's cultural history. The examples of traditionally knapped glass and metal shaped into a spearhead are quite uncommon. The metal artefacts in particular are endangered through ongoing activities of metal detectorists and fossickers in the area.
- Criterion (c): it has potential to yield information that will contribute to an understanding of the Territory's cultural history. This is an extensive site with areas that demonstrate particular activities at a critical period of history. It has very high potential to yield further information, and warrants further archaeological research.
- Criterion (e): it is important in exhibiting particular aesthetic characteristics. While the built structures no longer remain, the site demonstrates the aesthetics of location selection for the

settlement – on a high hill overlooking a river. The largest building foundation is ideally situated to take advantage of the views and the breezes.

- Criterion (f): it is important in demonstrating a high degree of creative or technical achievement during a particular period. The adaptation of traditional methods with new materials was, literally and figuratively, the cutting edge of creative and technical achievement at the time.
- Criterion (g): it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. Phillip Goodman and George Huddlestone Jabulgarri confirmed the cultural significance to Traditional Owners and the Aboriginal community in a broader sense. The site also has a strong association with mining and frontier history, and would therefore likely be considered significant by other community groups.

The site 201910191515 was recorded in conditions of low visibility, but appears to also be an extensive site of Aboriginal and historical occupation, possibly shared during the contact period. It extends to the vicinity of the Port Darwin Camp Cemetery (see historical places, below). This site is deemed particularly significant for its Aboriginal and historical values. It meets the following criteria under the Act:

- Criterion (a): it is important to the course, or pattern, of the Territory's cultural history. It demonstrates the experience of Indigenous and coloniser communities, reflecting a deep past and a critical time of change in our history.
- Criterion (b): it possesses endangered aspects of the Territory's cultural history. The metal artefacts in particular are endangered through ongoing activities of metal detectorists and fossickers in the area. The survey team documented some very recent disturbance on the top of the hill from this kind of activity.
- Criterion (c): it has potential to yield information that will contribute to an understanding of the Territory's cultural history. The site was recorded in low visibility, but demonstrates a high degree of potential to yield further information, and warrants further archaeological research.
- Criterion (e): it is important in exhibiting particular aesthetic characteristics. The site is located in a picturesque riverside location.
- Criterion (g): it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. Phillip Goodman and George Huddlestone Jabulgarri confirmed the cultural significance to Traditional Owners and the Aboriginal community in a broader sense. The site also has a strong association with mining and frontier history, and would therefore likely be considered significant by other community groups.

Historical objects

The survey team documented two isolated historical objects – a large metal ring, approximately 1.2m diameter, embedded in the ground (201910201015), and a V-shaped stone arrangement most likely to indicate a claim peg location (201910210905). Neither of these objects meets the criteria necessary to be considered significant under the Act. After assessing the significance of the V-shaped stone arrangement in the field, further observed examples were not documented.

Historical places

Five historical places and one recent historical place were documented by the survey team. They are assessed individually against the significance criteria below.

Site 201910191130 is a bottle dump, which has been disturbed by fossickers and heavy machinery. It is not considered significant according to the terms of the Act.

Recent historical place 201910211235 is a collection of concrete slabs and remnants of mining activities, with one stone artefact recorded ex situ. The site is assessed as not significant.

Site 201910200845 has 6 shallow adits. It is assessed as not significant on current evidence, though it is noted that it was recorded in conditions of low visibility.

Site 201910200945 is a completely destroyed site with remnants of concrete slabs, red brick and historical artefacts. It is assessed as not significant under the Act.

The grave and signage at Port Darwin Camp Cemetery are important physical markers of this historical place. While not technically part of the historical fabric of the cemetery, the signage represents community efforts to recognise and interpret heritage places in remote areas. It is important to note that the extent of the cemetery has not been ascertained, and requires further research to properly define, if future works are proposed within the vicinity. Caution must be exercised with regard to any works done around widening of the existing track or upgrading the river crossing in the vicinity of this and adjacent sites. The entire cemetery site, regardless of the lack of definition of the boundary, is assessed as highly significant under the following criteria.

- Criterion (a): it is important to the course, or pattern, of the Territory's cultural history. With at least 30 people buried in the cemetery, it is an important marker of the dangers of life in the area in the late 19th Century. It also marks the resting place of both Western and Asian members of the community, demonstrating multicultural aspects of the Territory's heritage.
- Criterion (b): it possesses uncommon, rare or endangered aspects of the Territory's cultural history. By virtue of the isolation of historical mining communities, cemeteries like this are uncommon and rare.
- Criterion (c): it has potential to yield information that will contribute to an understanding of the Territory's cultural history. The cemetery is little known and not fully understood. Further historical and non-invasive archaeological research has high potential to inform our understanding of Territory life and death in the late 19th Century.
- Criterion (d): it is important in demonstrating the principal characteristics of a class of cultural place. This cemetery demonstrates many principal characteristics of remote historical cemeteries, including the lack of enduring markers for grave sites, social stratification in marking graves of people in an enduring way. Further research would reveal whether or how the cemetery demonstrates the principal characteristics of burial practices relative to broader Western and Asian cultural norms of the day. This may reveal whether remote cemeteries in the NT conformed to or differed from accepted practice, and why.
- Criterion (e): it is important in exhibiting particular aesthetic characteristics. The site was selected for its aesthetic characteristics, which were seen as important for the appropriate resting environment of the deceased.
- Criterion (g): it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. The site is recorded on the register of the National Trust, and while social significance was not formally assessed through consultation, it is assumed that the cemetery has a strong association with descendant families and community and cultural groups.
- Criterion (h): it has a special association with the life or works of a person, or group of persons, of importance in the Territory's history. The cemetery is associated with early Chinese and

Western miners, whose works changed the economy and cultural life of the fledgling Territory. The site is also associated with William Knight Hay, a butcher and stock dealer who ran businesses in Palmerston (Darwin) and Port Darwin Camp (*The North Australian*, 7 Aug 1885, p.2). Hay's work demonstrated the role of essential suppliers to the maintenance of remote communities.

Human remains

Human remains, whether their location is known or unrecorded, are highly significant according to the following criteria:

- Criterion (a): it is important to the course, or pattern, of the Territory's cultural history. Mortuary practices change across time and across cultures, and are little studied in the NT. Death is an important cultural marker that reveals the pattern of cultural history.
- Criterion (c): it has potential to yield information that will contribute to an understanding of the Territory's cultural history.
- Criterion (d): it is important in demonstrating the principal characteristics of a class of cultural place. Further research would reveal the principal characteristics of burial practices related to broader Aboriginal, Western and Asian cultural norms of the day. This may reveal whether remote cemeteries in the NT conformed to or differed from accepted practice, and why.
- Criterion (g): it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. Ancestral remains are often of strong importance to descendant communities.
- Criterion (h): it has a special association with the life or works of a person, or group of persons, of importance in the Territory's history. The application of this criterion may be revealed with further research.

While the general location of the 30 recorded burials at the Port Darwin Camp Cemetery can be inferred within a distance of approximately 100m, there are other recorded burials in the district whose locations are not known – in particular the Fountain Head Cemetery and the Yam Creek Cemetery. There is also a probability of unrecorded burials from Indigenous occupation across millennia in the region. The probability of encountering these human remains during the course of proposed works cannot be quantified, so the Cultural Heritage Management Plan will include procedures to follow if unexpectedly encountering human remains.

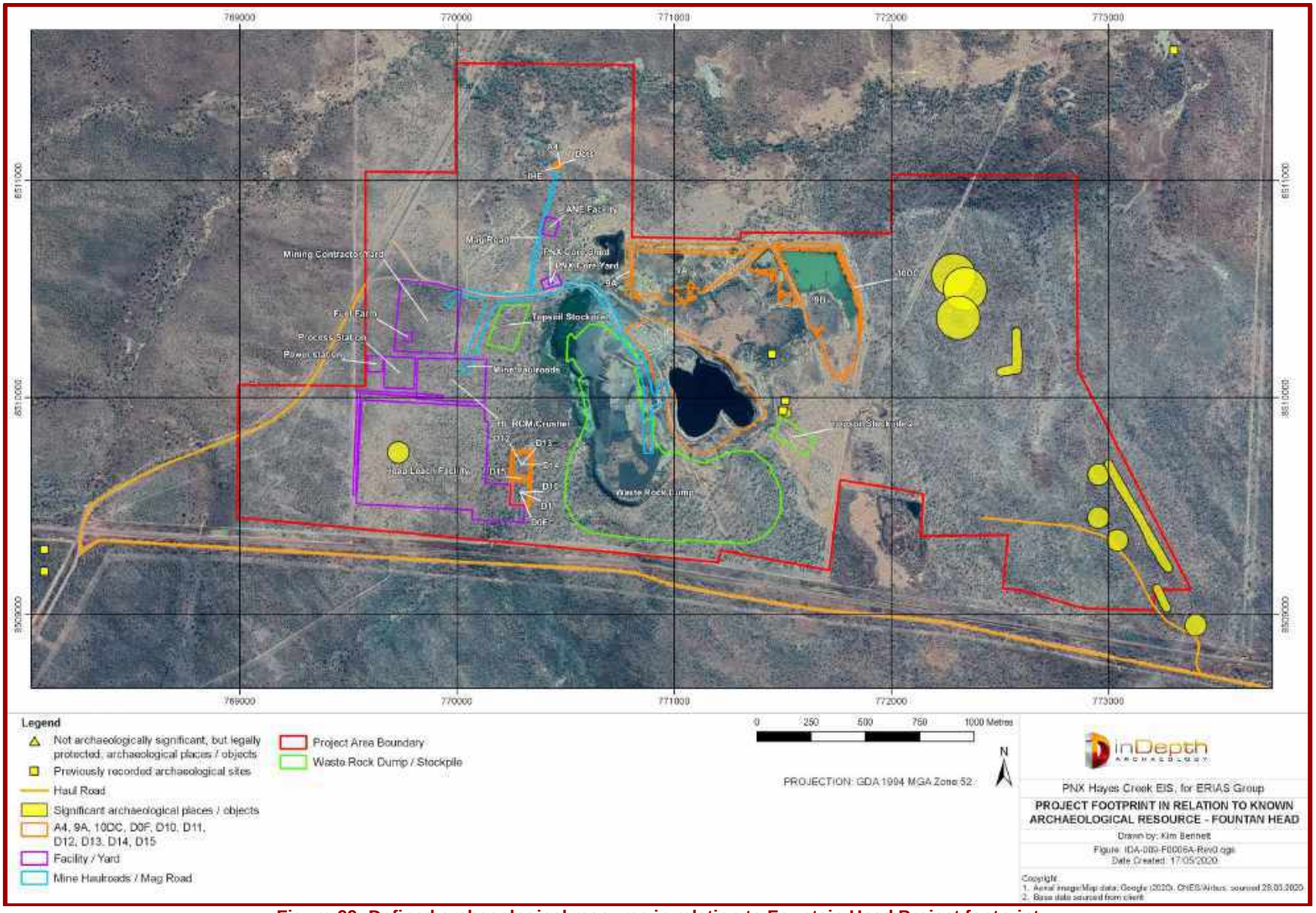


Figure 99: Defined archaeological resource in relation to Fountain Head Project footprint

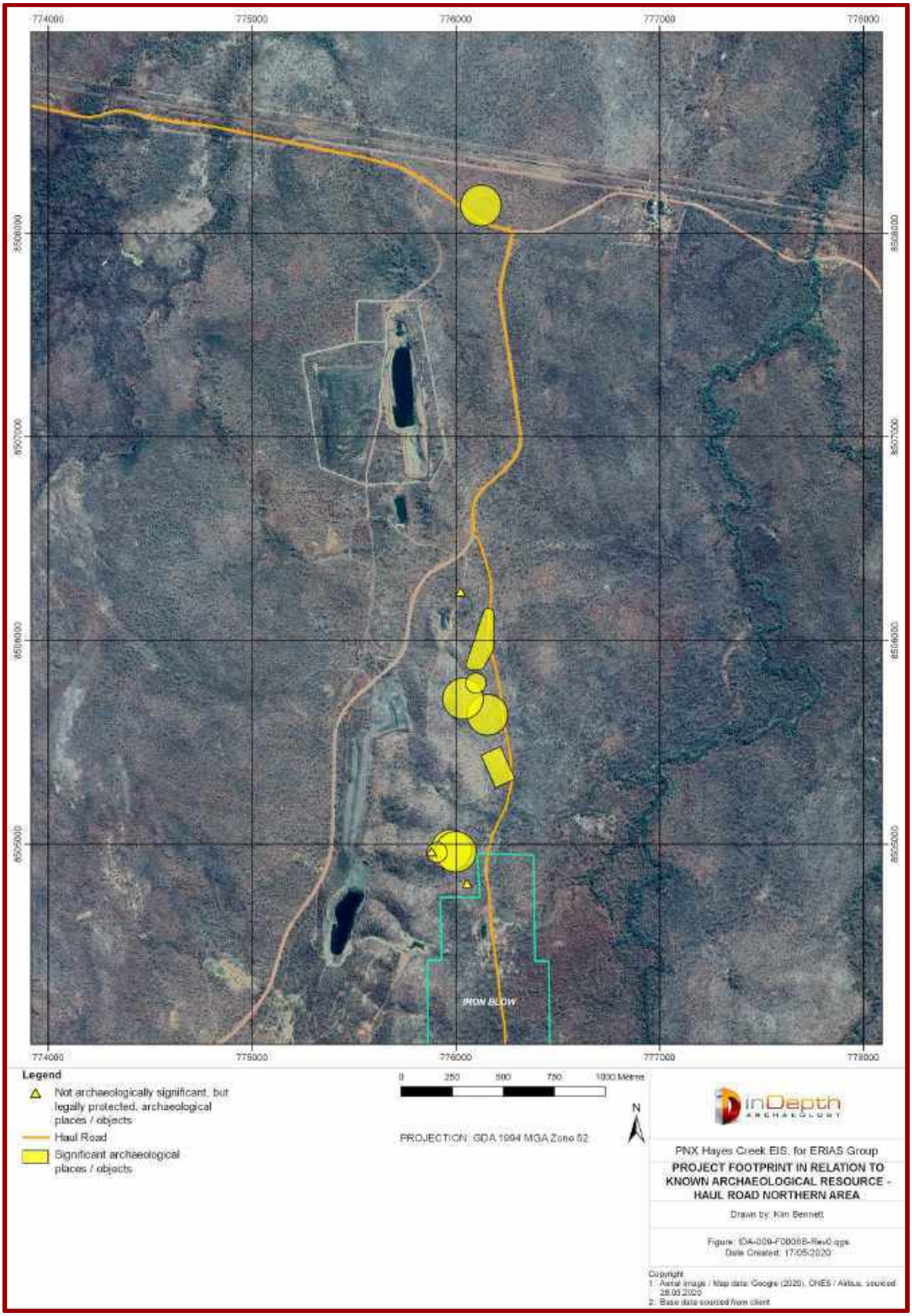


Figure 100: Defined archaeological resource in relation to the northern haul road area

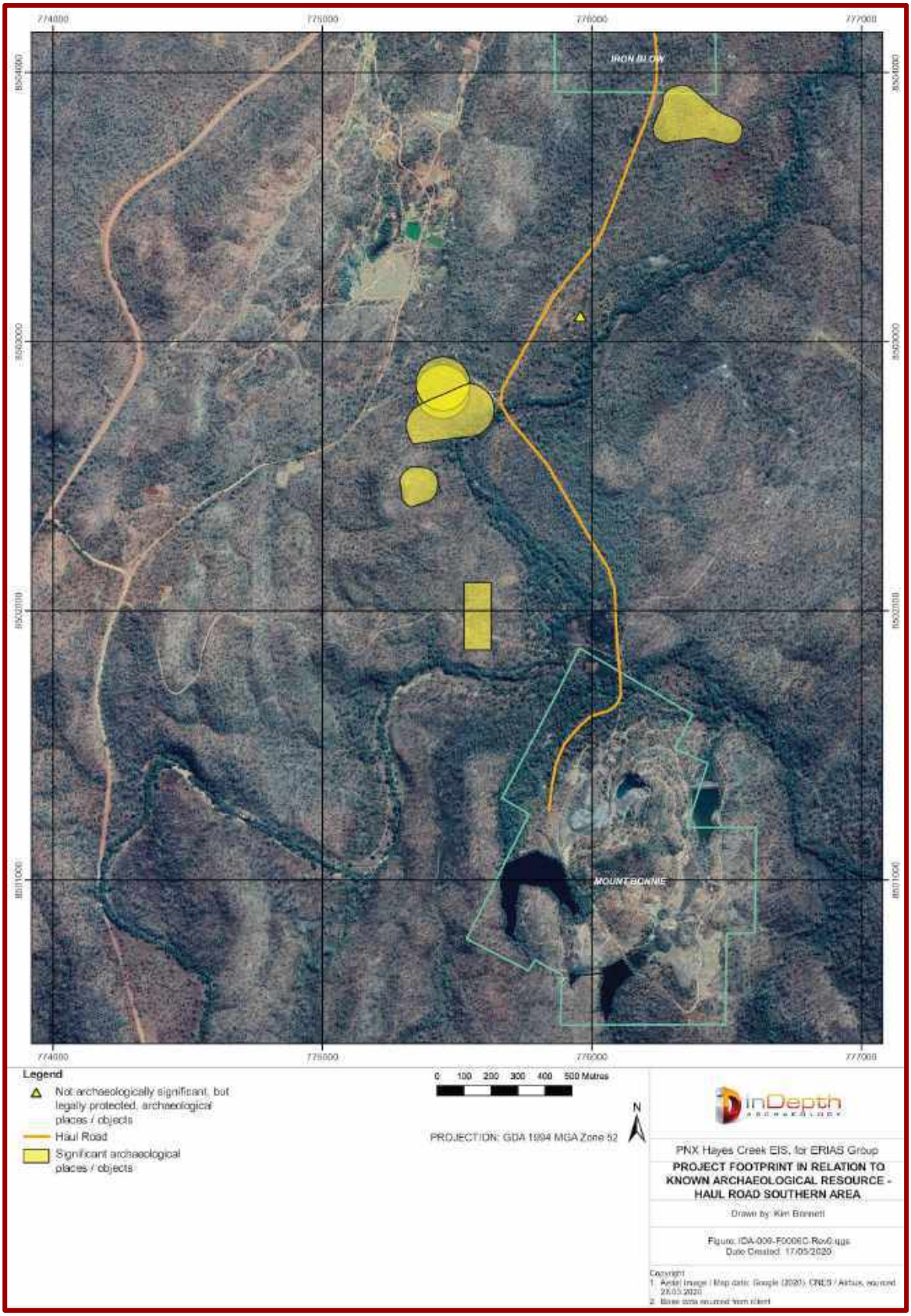


Figure 101: Defined archaeological resource in relation to the southern haul road area

8.0 Recommendations

The survey recorded 35 heritage places and objects, as defined under the *Heritage Act* 2012. Based on the survey results and the significance assessment contained herein, the consultant makes the following general recommendations.

9. That PNX and its contractors avoid all significant heritage places and objects, where possible.
10. That, if it is not possible to avoid disturbance of specific significant heritage places or objects, that they be salvaged archaeologically, in full consultation with Traditional Owners, and with all relevant permits. Further archaeological survey may be warranted to determine boundaries of places currently recorded as point data, due to limitations of ground surface visibility.
11. That, prior to any works, further survey be undertaken at Fountain Head in unsurveyed areas of high probability, and to document the condition of previously recorded archaeological sites, if the planned works are likely to affect these areas.
12. That, where the boundaries of a significant heritage place are mapped, they are implemented as a conservation buffer zone for that heritage place.
13. That a 100m conservation buffer zone be placed over Aboriginal places that are recorded as point data.
14. That a 50m conservation buffer zone be placed over identified Aboriginal objects.
15. That a Cultural Heritage Management Plan (CHMP) be developed, including measures for the induction of staff and contractors, management of unexpected finds, and management of identified heritage places and objects. The CHMP should also consider measures to deter fossickers and metal detectorists from causing further damage in the area (e.g. signage).
16. That the client maintains currency of all Authority Certificates in relation to sacred sites in the area. Queries about sacred sites should be directed to the Aboriginal Areas Protection Authority.

For site-specific management recommendations, see Table 6 below. For heritage management recommendations within the Iron Blow and Mount Bonnie lease areas, refer to Martin-Stone (2016) at Appendix A.

Table 6: Site specific management recommendations

Site Name	Site Type	Easting	Northing	Cultural Significance	Archaeological significance	Management recommendation
FOUNTAIN HEAD AREA						
201910220850	Aboriginal object	773401	8508951	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221030	Aboriginal object	772954	8509645	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221040	Aboriginal object	772952	8509447	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221045	Aboriginal object	773040	8509343	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221220	Aboriginal object	769730	8509747	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910221500	Aboriginal place	772286	8510563	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221510	Aboriginal place	772339	8510499	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910221515	Aboriginal place	772308	8510368	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910220900	Aboriginal place	773266	8509032	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910220945	Aboriginal place	773275	8509213	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*,

						and with agreement from Traditional Owners regarding ongoing care of the artefacts.
21910221545	Aboriginal place	772580	8510129	Significant	Significant	Impose a conservation buffer zone according to the mapped boundaries. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
HAUL ROAD NORTHERN AREA						
201910231015	Aboriginal object	776098	8505791	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910210830	Aboriginal object	775880	8504955	Significant	Not significant due to poor site condition.	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910210840	Aboriginal object	775906	8504959	Significant	Low significance	Impose a 50m conservation buffer zone. May be disturbed (salvaged) with appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts
201910230953	Aboriginal place	776154	8505635	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910231010	Aboriginal place	776034	8505714	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910231020	Aboriginal place	776074	8505881	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Conduct more detailed survey prior to any works in the area. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210845	Aboriginal place	775975	8504971	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210900	Aboriginal place	775999	8504962	Significant	Significant	Impose a 100m conservation buffer zone. May be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910211450	Aboriginal place and	776237	8505308	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed. If it must be disturbed, it should be

	historical place					salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210945	Aboriginal place and historical place	776054	8504798	Significant	Not significant due to poor site condition.	Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910211210	Aboriginal place and historical place	776122	8508136	Significant	Significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910210905	Historical Object	776010	8504969	Not assessed	Not significant	Object is not legally protected or significant. Works may proceed in this area.
201910191130	Historical place	776130	8506638	Not assessed	Not significant due to poor site condition.	Site is not legally protected or significant. Works may proceed in this area.
201910211235	Recent historical place	776022	8506232	Not assessed	Not significant	Site is not legally protected or significant, aside from single Aboriginal stone artefact identified. Works may proceed in this area if necessary, with permit to disturb isolated artefact.
HAUL ROAD SOUTHERN AREA						
201910191340	Aboriginal place	775575	8501928	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910200820	Aboriginal place	775313	8502488	Significant	Significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed. If it must be disturbed, it should be salvaged archaeologically with an appropriate permit under the *Heritage Act*, and with agreement from Traditional Owners regarding ongoing care of the artefacts.
201910201005	Aboriginal place and historical place	775956	8503088	Significant	Not significant due to poor site condition.	Historical artefacts are not protected by legislation. Aboriginal artefacts may be salvaged with appropriate permit under the Heritage Act, and with agreement from Traditional Owners about ongoing care of artefacts.
201910201115	Aboriginal place and Historical place	776508	8503784	Significant	Highly significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed, and undertake further archaeological investigation if possible.

201910191515	Aboriginal place and historical place	775538	8502746	Significant	Highly significant	Impose a conservation buffer zone according to the mapped boundary. Recommended to be left undisturbed, and undertake further archaeological investigation of the westernmost hill in conditions of better visibility, to properly document the site boundary.
201910201015	Historical Object	775956	8503171	Not assessed	Not significant	Object is not legally protected or significant. Works may proceed in this area.
GRAVE	Historical place	775446	8502813	Significant	Highly significant	Impose a 100m conservation buffer zone. Recommended to be left undisturbed. Geophysical investigation to define the boundaries of the cemetery, and further historical and archaeological research, would be necessary to develop appropriate management measures for the cemetery.
SIGNAGE	Historical place	775447	8502843	Significant	Significant	Recommended to be left undisturbed. While not technically part of the historical fabric of the cemetery, this signage represents community efforts to recognise and interpret heritage places in remote areas. If it is necessary to disturb the signage, it should be replaced with updated equivalent interpretive materials.
201910200845	Historical place	775422	8502569	Not assessed	Not significant	Site is not legally protected or significant. Works may proceed in this area.
201910200945	Historical place	775802	8503082	Not assessed	Not significant	Site is not legally protected or significant. Works may proceed in this area.

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In Depth Archaeology

PNX Archaeological Survey, 2016

A report on the archaeological survey of PNX Metals' NT exploration leases, 2016

A report to PNX Metals

by Karen Martin-Stone

12 October 2016

A report on the archaeological survey of PNX Metals' NT exploration leases, July - August 2016.

Prepared by: *Karen Martin-Stone*

Version notes:

Version	Author	Date	Changes
V1.0	Karen Martin-Stone	5/11/2016	First draft

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1.0 Executive Summary

PNX Metals engaged Karen Martin-Stone, of In Depth Archaeology, to conduct an archaeological survey and assessment of their proposed 2016 drilling program on the Burnside, Chessman and Moline leases in the Hayes Creek to Katherine area. The survey was undertaken from 19-25 July 2016 and 17 August 2016.

The survey recorded 28 archaeological places (n. = 22 Aboriginal, 6 historical places) and 16 archaeological objects (n. = 15 Aboriginal objects, 1 historical object), as defined under the NT *Heritage Act* 2012. This report details the survey methodology and results, and makes recommendations for the protection of archaeological sites and artefacts in accordance with the existing legislation.

1.1 Summary of Recommendations

The consultant makes the following recommendations:

- That the client avoids disturbance of the high risk area identified in the Moline prospect, until such time as an archaeological survey can be undertaken in conditions of higher visibility.
- That a 100m conservation buffer zone be placed over all identified Aboriginal places.
- That a 50m conservation buffer zone be placed over all identified Aboriginal objects.
- That historical places and objects be avoided if possible during the course of works.
- That if staff or contractors encounter suspected Aboriginal heritage materials during the course of works, disturbance of the area should cease and further advice be sought from the consultant.
- That the client continues to provide a cultural heritage induction to all staff and contractors working in the area upon commencement of work.
- That the client maintains currency of all Authority Certificates in relation to sacred sites in the area. Queries about sacred sites should be directed to the Aboriginal Areas Protection Authority.

2.0 Introduction

PNX Metals engaged Karen Martin-Stone, of In Depth Archaeology, to conduct an archaeological survey of proposed disturbance areas associated with their 2016 exploration program (see Fig. 1-3). The works are proposed across PNX Metals' Burnside, Chessman and Moline leases. The survey areas are located across the Hayes Creek, Pine Creek and Katherine areas, approximately 175km-300km south of Darwin. PNX Metals' exploration program includes establishing new tracks and drill pads, as well as undertaking geophysical survey that does not require significant ground disturbance.

The consultant undertook the archaeological survey from 19-25 July 2016, and 17 August 2016. PNX Metals and the consultant made numerous attempts to seek contact information for the Traditional Owner representatives are for the survey areas, however this information was not forthcoming from the Northern Land Council. The consultant contacted Bessie Coleman, a known representative of the Jawoyn Three Clan Group, whose country covers the Moline lease. Bessie accompanied the consultant in the field for the Moline survey, and was consulted regarding the cultural significance of archaeological places and objects recorded in this area.

This report outlines the legislative basis for heritage protection in the NT, reviews the environmental and cultural background of the areas of interest, and provides recommendations for the management of archaeological places and objects recorded during the survey.

The survey recorded 28 archaeological places and 16 archaeological objects, as defined under the NT *Heritage Act* 2012. The findings of the survey are consistent with past archaeological surveys in the area, and fit the expectations of predictive models of site location in the region.

All maps for the fieldwork and report, aside from Figures 1-3 below, were prepared by Alex Giurgiu for In Depth Archaeology. All mapping and site recording is in the GDA94 datum, Zone 53.

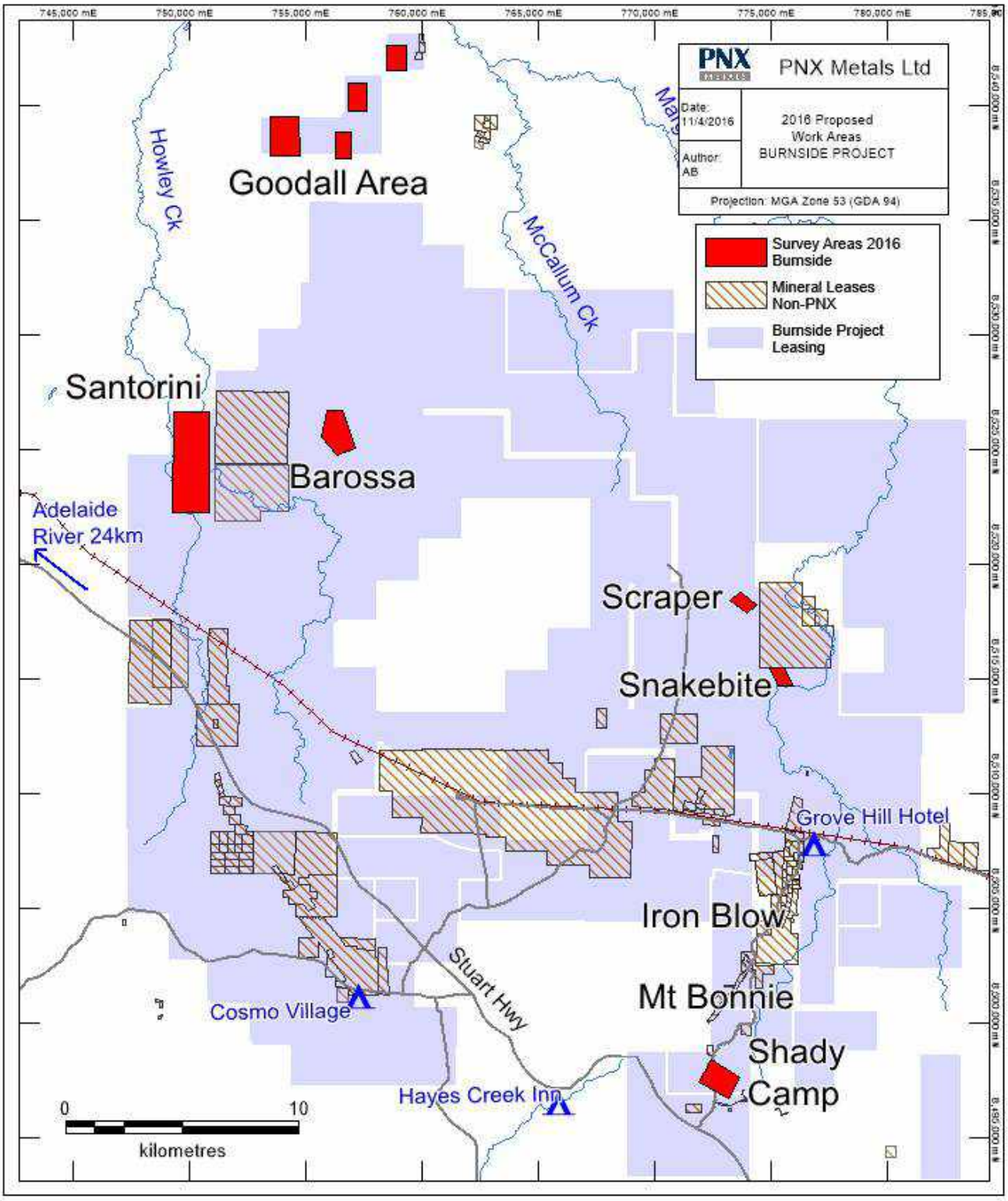

Figure 1: PNX Metals survey areas in the Burnside Project

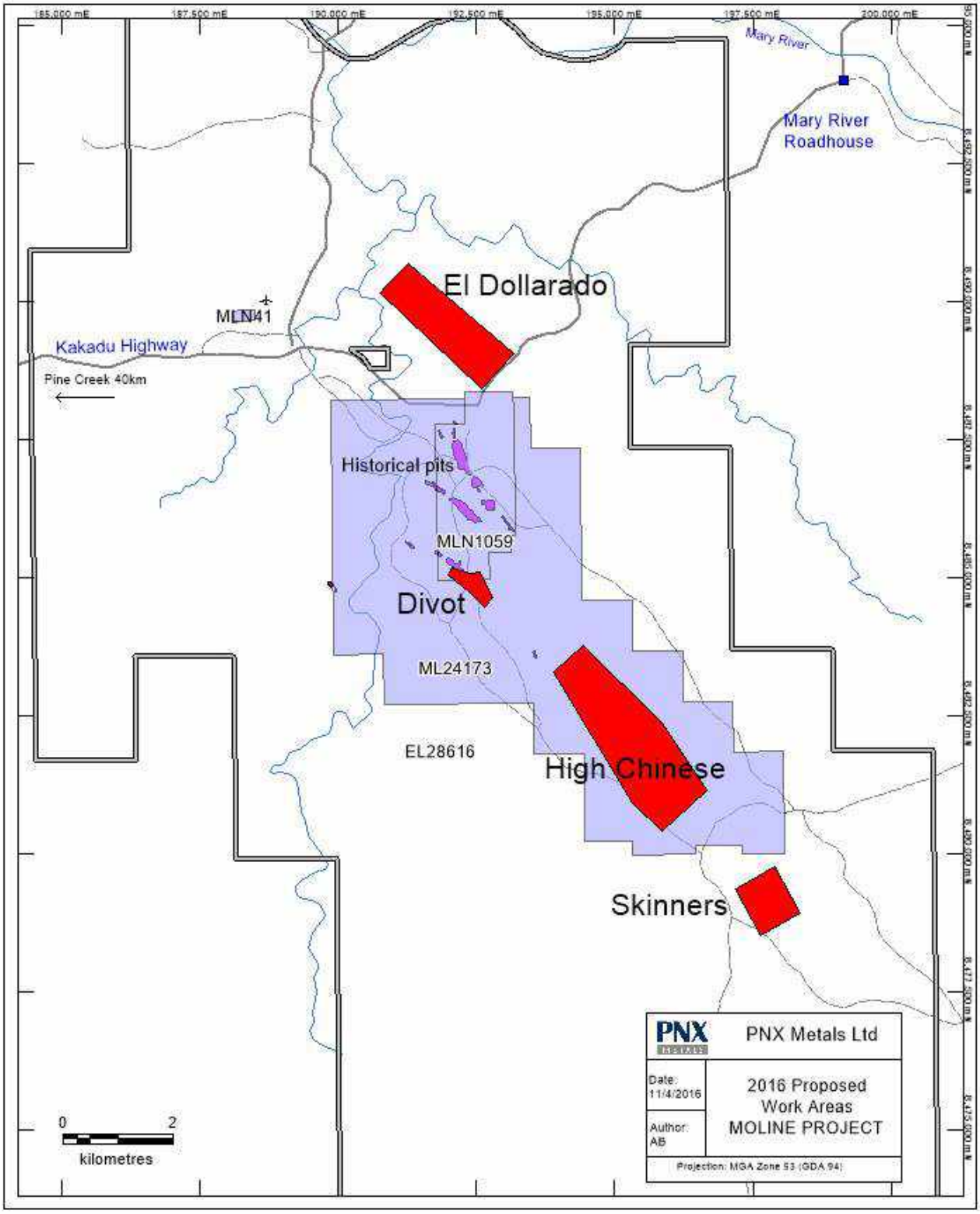

Figure 2: PNX Metals survey area in the Moline Project

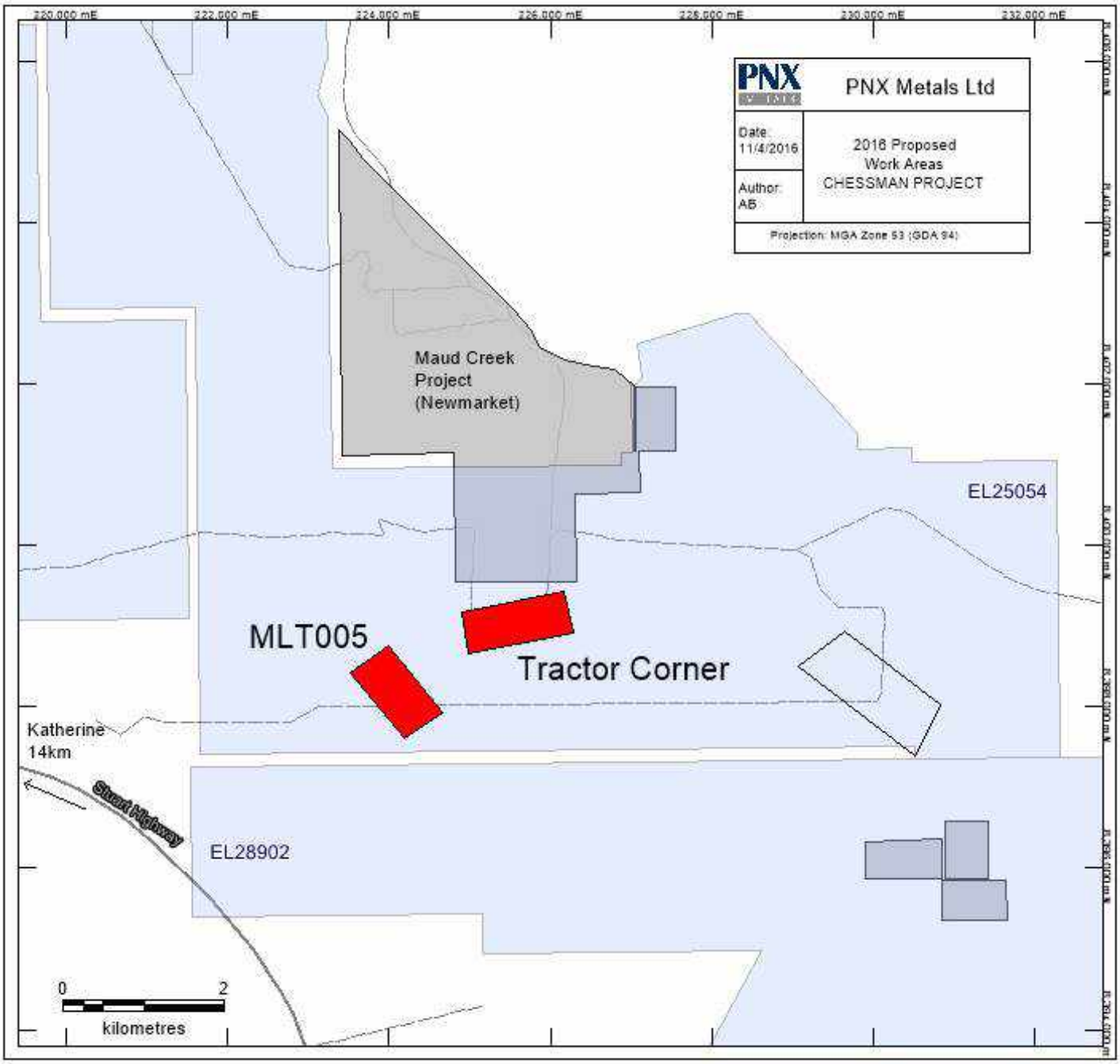

Figure 3: PNX Metals survey area in the Chessman Project

3.0 Legislative Basis for Heritage Protection

Cultural heritage conservation legislation is complicated in Australian jurisdictions. This is the result of the evolution of the Australian constitutional framework, particularly the inclusion of new themes, such as Aboriginality, heritage and the environment into an existing regulatory framework. The result of this developmental change is that the Commonwealth retains responsibility for Indigenous issues, including some cultural heritage issues, while the States and Territories retain control of land use and development control areas. Therefore, both Commonwealth and Northern Territory Acts apply in particular circumstances within the Northern Territory.

3.1 Commonwealth Acts

***Aboriginal Land Rights (Northern Territory) Act* 1976 (ALRA):** The ALRA's primary purpose was to address land ownership issues for Indigenous Territorians that were seen as the Traditional Owners of lands in Aboriginal Reserves such as Arnhem Land. These lands had essentially remained in Aboriginal custodianship and the Commonwealth moved to make them a special type of freehold land. The ALRA also defined Sacred Sites as places 'sacred or otherwise of significance in the Aboriginal Tradition'. The Act also provides for the formation of Land Councils tasked with protecting the rights of all Aboriginal people in the NT, particularly in the areas of land claims under ALRA and the Native Title Act 1991. The Land Councils also advance Aboriginal employment and training, and participate in the management of mineral tenements on Aboriginal lands.

***Native Title Act* 1993:** The Native Title Act gives some Aboriginal people the ability to access and use traditional lands for some purposes. Native Title claimants may enter into agreements with other interested parties, on the nature of land use and access to land, including the protection of cultural heritage resources. These agreements are known as Indigenous Land Use Agreements (ILUAs).

***Aboriginal and Torres Strait Islander Heritage Protection Act* 1984:** This Act is a site protection Act of 'last resort', meaning that the Act is meant to provide emergency protection for Aboriginal and Torres Strait Islander heritage sites when all other avenues have been exhausted. Generally an Indigenous group must apply to the Minister to have protective covenants placed over an area or site. The power to provide such protection resides in Section 51 of the Constitution giving the Commonwealth powers on Aboriginal issues. Therefore this Act may override all State and Territory cultural heritage acts where there are conflicting provisions.

***Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act):** The EPBC Act is the Commonwealth Government's main piece of environmental legislation. It provides a legal framework to manage significant natural and cultural heritage places. With regard to cultural heritage, the Act proscribes the criteria for listing National Heritage places and Commonwealth heritage places, and management principles for same.

The introduction of the EPBC Act created two new heritage registers, the National Heritage List, and the Commonwealth Heritage List. These registers replaced the Register of the National Estate.

- The National Heritage List is a list of natural, historic and Indigenous places that are of outstanding significance to the nation.
- The Commonwealth Heritage List is a list of natural, historic and Indigenous heritage places that are owned or controlled by the Australian Government.

- The Register of the National Estate is no longer a statutory list. It is being maintained as an archive of information about more than 13,000 places throughout Australia.

As the Commonwealth has no powers in regards to land use (other than on Commonwealth owned lands) the power emanating from the EPBC Act resides in the Commonwealth's powers to negotiate funding and other arrangements in relation to conservation of heritage places.

3.2 Northern Territory Acts

The NT Aboriginal Sacred Sites Act 1989 protects sites that are 'sacred and otherwise of significance in the Aboriginal Tradition'. Sacred Sites are protected whether the location of the sites are known or not by any person or company seeking to do work on lands. The Aboriginal Areas Protection Authority (AAPA) administers the Act. The AAPA can issue a Certificate indemnifying a proponent for an area upon application and payment of a fee. The Certificate may contain conditions limiting or preventing works in and around registered and recorded Sacred Sites. The Authority Certificate will contain maps outlining any restricted work areas in the area of application.

The NT Heritage Act (2012) establishes the Heritage Council and the Heritage Register, protects significant heritage places and objects, and sets penalties for offences against the Act. The Heritage Act provides 'blanket' protection for Aboriginal and Macassan archaeological places and objects, until a decision by the Minister to either permanently protect these places or permit their disturbance or destruction. This decision making process is triggered by an application to disturb these places. There are penalties for accidental or deliberate destruction of these sites. The Act also sets the process by which other significant places or objects may be added to the Heritage Register, and afforded protection under the Act. The Act allows for processes to approve works and maintenance on a declared heritage place.

4.0 Physical Environment

The survey areas are located within the Pine Creek Geosyncline, a large intrusion of mineral rich ore seams which have formed the basis of the mining industry in the Hayes Creek, Pine Creek and Katherine regions since the 1870s.

In archaeological terms the underlying geology indicates:

1. The Burrell Creek Formation contains greywacke, siltstone, sandstone and shale, which are likely to be present in and near the survey areas. Fine to coarse feldspathic metagreywacke occurs in nodules and outcrops in the region. It is an isotropic rock with well-developed conchoidal fracture properties, and was well suited to use in the production of axes and blades. It is amongst the most prominent raw materials in most stone artefact assemblages in the Top End, and numerous quarry sites have been recorded in the region (Martin-Stone & Woolfe, 2012).
2. Quartz outcrops occasionally in and near the survey areas. These rocks are also among the most prominent raw material in most stone artefact assemblages in the Top End. However, the relatively low availability of quartz in the survey areas, compared to greywacke, means it is less likely to be the dominant raw material in assemblages in the Project Area.
3. Granite and granitic sands in the Pine Creek Geosyncline. Granitic intrusion into existing sedimentary formations caused mineralization and the alteration of rocks. The heat and pressure of the igneous intrusions has caused the formation of occasional chert nodules in limestone deposits that are used as the raw material for stone tools. This is more likely to occur in the Chessman survey area.

Pietsch and Stuart Smith (1987:4) describe three geomorphological units relevant to the Project Area:

1. Dissected Foothills: Skeletal gravelly and lateritic soils on rubbly rises and low hills dissected by small perennial watercourses. The vegetation on these units is generally mixed stunted woodland grading to open eucalypt woodland dominated by Corymbia miniata and Eucalyptus tetradonta.
2. Dissected Uplands: Shallow gravelly and rocky skeletal soils on prominent strike ridges and boulder strewn hills. The vegetation is generally mixed open eucalypt woodland.
3. Alluvial Plains: Black soil and sand plains often fill between strike ridges, hills and rises. These enlarge toward the north of the project area and toward the larger estuarine and coastal plains. Alluvial plains aggrade over time covering artefacts and sites. Hence it is unlikely to find many archaeological sites in these areas, however some do exist. Vegetation on alluvial plains is dominated by mixed eucalypt woodlands, grassland among stands of Pandanus spiralis and Livistona humilis.

The project area generally consists of open tropical woodland with a grass understorey. The vegetation is dominated by Corymbia miniata and Eucalyptus tetradonta, with ironwood also present in small numbers.

Vegetation growth during the wet season often impedes ground visibility throughout the Top End. The 2015-16 wet season recorded significantly below average rainfall, so vegetation in most areas allowed moderate to good visibility. Some tracts of the survey areas had been recently burned, ensuring excellent surface visibility. This report notes areas of low visibility that were unable to be surveyed yet exhibit archaeological potential.

5.0 Cultural Background

5.1 Archaeological background

The arrival of modern humans onto continental Australia has been dated to at least 50,000 years BP (Before Present) (Roberts, et al, 1990). These dates were obtained from samples taken from sites in Kakadu National Park, indicating broader occupation of the Top End region. Archaeologists believe that the most likely region of arrival was the Kimberley and Top End coastline. Much lower sea levels at the time mean that the earliest occupation sites are likely to be underwater.

The archaeological record of the Top End region shows very gradual change in material culture throughout this late Pleistocene period and into the mid-Holocene (around 5,000 years ago). The early stone tool industry is known as the 'Australian core tool and scraper tradition.' It is characterised by large core tools, and steep-edged, chunky, high-backed scrapers (Flood, 1995:49). Ground-edged axes first appear in the archaeological record at about 35,000 BP (Geneste, et. al., 2010). By 23,000 BP they became more common in Kakadu, and some featured waists for hafting (Flood, 1995:88).

In the mid-Holocene, approximately 5,000BP, an abrupt change occurred in the archaeological record with the introduction of the Australian small tool tradition, and the subsequent arrival of the dingo approximately 4,000 BP (Flood, 1995:221). The Australian small tool tradition is characterised by smaller, more delicate tools including backed blades, points, tulas and burren adzes. The changes in the stone tool tradition in the mid-Holocene were accompanied by changes in rock art styles and an increase in charcoal, animal bone, artefacts, shell fish and ochre in archaeological deposits. Flood & David (1994) hypothesise that the arrival of stone point technology coincided with the systematic manufacture of blades approximately 3,000 years ago.

The specific chronology of Indigenous occupation of the Pine Creek area is less well understood, owing to a lack of archaeological excavation of stratified deposit, however it is highly probable that it broadly reflects the chronology of cultural change in the broader Top End region. A large number of archaeological surveys have been conducted in the area, in association with mineral exploration, mining and other development (see Baker & Hughes 1983; Baker 1983a, 1983b; Bell 1981, 1983; Brockwell & Cane 1987; Crassweller 2006a, 2006b, 2006c, 2008, 2011a, 2011b, 2011c, 2012a, 2012b; Cundy 1987; Earth Sea Heritage Surveys 2008, 2013; Guse 1995, 1997, 1998; Hill 2005; Hiscock 1991; Hiscock & Mowat 1991; Keys & Woolfe 2013; Kinhill Engineers 1992; Kinhill 1989; Lance 1990; Martin-Stone & Woolfe 2011, 2012, 2013; Mitchell 1993a, 1993b, 1994a, 1994b; Mulvaney & Hermes 1988; Mulvaney 1992; Paton 1993; Raupp et al 2009; Tacon 1988; Woolfe 2013; Woolfe & Martin-Stone 2011, 2012).

The archaeology of the Pine Creek region is very homogenous, and distinct from the archaeology of the escarpment country of Kakadu and Western Arnhemland, owing to the characteristics of the Pine Creek Geosyncline. The geology of the area, particularly outcropping stone referred to in various reports as hornfels, tuff, Burrell Creek Formation or felfspathic metagraywacke, provides excellent raw material for the manufacture of axes, blades, points and other flaked artefacts. A 2009 review of archaeological sites recorded within the Pine Creek 1:100,000 map sheet (Earth Sea Heritage Surveys 2008) found a significant proportion of sites in the region to be quarry sites with artefact

scatters (see Fig 4). Many more archaeological surveys since then have recorded numerous quarry sites, and confirmed their preponderance in the region.

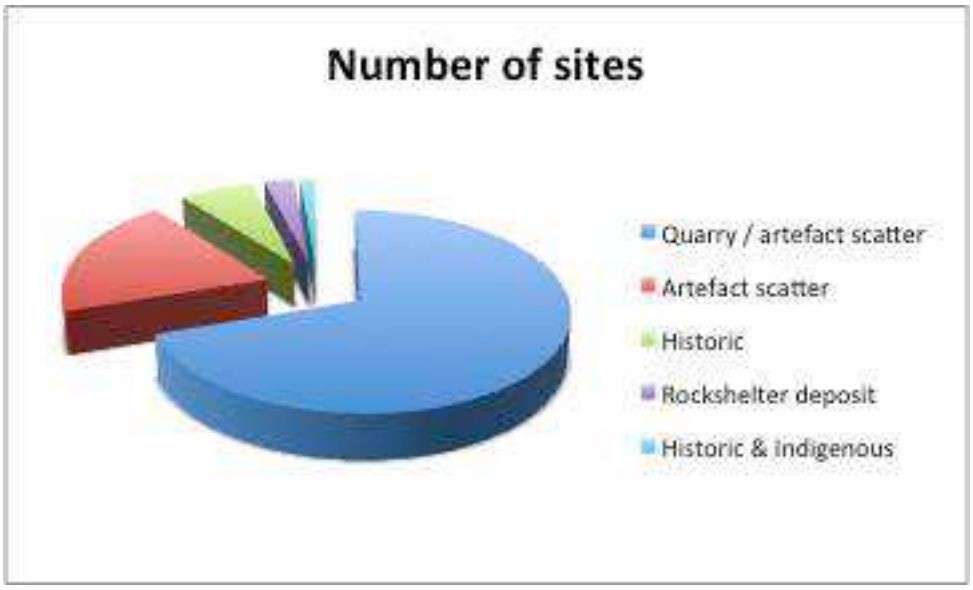

Figure 4: Distribution of archaeological site types within the Pine Creek 1:100,000 map sheet (after Earth Sea Heritage Surveys 2008)

The quarry sites with associated artefact scatters are consistently distributed across specific landscape features – they are most commonly recorded on ridges, hill slopes and creek lines. The sites range in size and density, and have been categorised as major or minor quarries (Mulvaney 1992). Hiscock (1991) suggests variability in the sites reflects chronological differences as well as raw material quality. Baker (1983) and Mulvaney (1992) hypothesised that Aboriginal people quarried long flakes (large blades) in the quarry sites, and these were transported to knapping floors for further reduction, eventually discarded in campsites as fully finished tools. Martin-Stone & Woolfe (2013) confirmed this multi-stage reduction of tools across the landscape with their analysis of a sample of surface artefacts within the Mount Todd site MT26, which was estimated by Paton (1993) to contain 45 million artefacts.

The artefact types that have been documented within the region are flakes, cores, retouched flakes, flaked pieces, unifacial points, bifacial points, Kimberley points (rare), ground-edged axes, flaked axes, axe blanks, blades, bipolar-percussed blades, hammer stones, and grindstones (mortars and pestles). Average artefact densities vary greatly on sites and in the isolated background scatter. Raw material types are dominated by the hornfels / tuff / Burrell Creek Formation / feldspathic metagraywacke, then quartz, followed by lesser amounts of siltstone, quartzite, sandstone, silcrete, fine grained sedimentary (FGS), dolerite and chert.

5.2 Historical background

The Indigenous occupation of the Pine Creek region did not cease with the arrival of colonial cultures, and continues to the present day. The Jawoyn people of the region experienced colonial history in

parallel with European and Asian arrivals, often working together in trade and on mines, pastoral stations and the war effort, while also being subject to some of the worst impacts of the historical era including the Stolen Generation, massacres of Indigenous people by police and pastoralists, loss of land, lost wages and the Japanese bombing raids of World War II (Coleman, pers. comm.; Merlan 1998; Pearce 1982).

The historical period commenced in the broader Pine Creek region with the passing of John McDouall Stuart as he traversed the continent in 1862. Stuart noted that the region may be rich in alluvial gold. This was confirmed in December 1870, when workmen constructing the Overland Telegraph Line (OTL) discovered enough gold to trigger a gold rush to the region (Pearce 1982). The OTL was the first communication link of its time that connected Australia with the rest of the world. Running from Adelaide to Darwin, and then by undersea cable to Indonesia, its opening in 1872 revolutionised communication between the colonies and Great Britain (Powell 2000).

The first mining boom in the Pine Creek region ran from 1872 – 1874. The area has subsequently ridden a boom and bust economy that peaked in the 1870s, 1880s, 1900s, 1930s, 1960s-'70s (Jones 1987), and the early 21st Century. In addition to the township of Pine Creek, smaller settlements cropped up in closer proximity to the mines, including Hayes Creek, Burrundie, Mount Wells, Grove Hill, Union Reef and others. While the region is known for gold, it has also be mined for wolfram, lead, galena, tin, copper, silver and uranium (Donovan 1979). Early mining ventures struggled with geographic isolation, challenging climate, mismanagement and the vagaries of the market (Jones 1987).

The mining booms brought associated industry and services, often run by Chinese merchants (Jones 1987). The Chinese workforce was essential to the operations of the mines, and concessions to the White Australia Policy were made by the Northern Territory Administration in order to maintain the viability of the broader NT economy (Powell 2000). The Chinese community outnumbered Europeans in the NT in the 1880s, and went on to become a well-established community in both Darwin and Pine Creek, and surrounding settlements, remaining even in times of bust.

The pastoral industry was slower than mining to establish in the Pine Creek region, and many early attempts failed due to the challenges of climate, stock diseases, and isolation from market (Powell, 2000). The industry continues to the present day, often alongside exploration and mining on the pastoral leases.

The railway played a large part in the economic viability of the region. Construction of the line from Darwin to Pine Creek commenced in 1886. It reached Burrundie in 1888, and Pine Creek in 1889. It was extended to Emungalan (Katherine) in 1917, and further south to Birdum in 1929. The corridor it followed was roughly the same route as Stuart's overland trek. A railway branch extended to the east of Pine Creek, which connected Burrundie, Twelve Mile and Union Reef to the main line. The railway was operational until the mid-1970s, and later was replaced by the North Australian Railway which connected Adelaide to Darwin, opening in 2003.

The railway was key infrastructure for operations in World War II, during which time Pine Creek served as a communication centre, a staging post and the base for ten military units. Civilians (mainly

non-Indigenous) were evacuated from the Pine Creek region when the Top End came under full military control from 1942-1946. Mining ceased abruptly at this time (Bell 1983, Donovan 1979).

Since WWII, the area has experienced two more mining booms, and the introduction of a viable tourism industry capitalising on its mining heritage and proximity to Kakadu National Park and the Katherine region.

6.0 Methodology

The survey was carried out by project archaeologist, Karen Martin-Stone, of In Depth Archaeology. Traditional Owner representative, Bessie Coleman, also participated in the survey and consultation process for the Moline area. PNX Metals' field assistant, Sam Eastwood, accompanied the consultant in the field in the Barossa area and the Santorini area.

The survey plan was based on coverage of the proposed access tracks and drill pads, plus inspection of areas with high archaeological potential, taking into account the patterning of archaeological sites previously found in the region, identified areas of Traditional Owner concern, sampling requirements and level of proposed disturbance.

The archaeological survey aimed to locate and record any archaeological places or objects, as defined by the NT *Heritage Act* 2012. The aim of the survey was to identify and record archaeological evidence within a reasonable sample the predominant landforms (ridges, valleys, plains and watercourses). The archaeological survey used stratified random sampling and purposive sampling, with a particular focus on areas of proposed disturbance. These methods are in accordance with standard practice for field archaeology (see Burke & Smith, 2004:68).

6.1 Identification of archaeological places and objects

Archaeological places and objects are otherwise referred to as sites and artefacts. There are many different site types commonly found in Australian archaeology (Burke & Smith 2004, Pearson & Sullivan 1995). Common site types found across the Northern Territory are:

- **artefact scatters:** These may contain flaked or ground stone artefacts and hearthstones. They may occur as stratified deposits or surface scatters of artefacts.
- **shell middens:** These sites are usually mounds of discarded shell and other artefacts, associated with coastal occupation. The mounds can be quite large – 8m tall middens have been recorded in the Northern Territory.
- **rock art sites and shelters:** These sites may contain paintings, stencils or engraved art, along with artefacts indicating occupation.
- **stone arrangements:** These sites exhibit the deliberate construction of cairns, lines or polygons with stone. They may be small, such as a single cairn, or large and complex, covering hundreds of metres.
- **quarries of stone and ochre:** These sites are generally locations where outcropping stone has been flaked for the removal of material used to make stone tools. The sites can occur on very small outcrops, or as major industrial complexes at the centre of vast trading networks.
- **burials:** These sites include human remains in all forms of burial practice, including interment, exposure and the depositing of remains in rock shelters.
- **isolated stone artefacts:** These artefacts occur as background scatter across the landscape, and are integral to understanding the patterns of occupation, as well as trade networks and other past life ways.

- **culturally modified trees:** These trees have been scarred or felled in activities ranging from accessing food sources (e.g. honey), or the manufacture of wooden artefacts including didgeridoos, bark canoes, and food containers.
- **built heritage**, including industrial and maritime sites, and
- **isolated historical artefacts**, commonly made of metal, glass or ceramic.

6.2 Information management

The location of all archaeological features was recorded using a handheld Garmin GPS62s unit, in UTM GDA94. They were mapped using MapInfo V10.0, by Alex Giurgiu for In Depth Archaeology. Standardised site recording forms, adapted from Burke & Smith (2004), were used to record the details of the sites. The archaeological features were given identification numbers to correspond with the date and time of recording, to match with photo metadata.

7.0 Results & Discussion

The archaeological survey recorded 28 archaeological places (n. = 22 Aboriginal places, 6 historical places), and 16 archaeological objects (n. = 15 Aboriginal objects, 1 historical object), as defined under the *Heritage Act*. The Aboriginal places and objects are presumptively protected by the Act, until such time as the Minister may approve a permit to disturb. None of the historical places or objects are currently protected under the terms of the Act, as protection of historical heritage requires a nomination and registration process. However, some of the historical heritage is located within the conservation buffer zone recommended for Aboriginal heritage recorded during the survey, which precludes ground disturbance.

These survey results are summarised in Table 1, below, and detailed on the following pages for each survey area. The locations of archaeological places or objects recorded during the survey are mapped according to survey area.

Site Name	Site Type	Easting	Northing	Contents
201607210830	Historical place	776125	8504914	Mid to late 20th C bottle dump.
201607210845	Historical place	776258	8504889	Remains of brick building
201607210900	Aboriginal place	776263	8504847	Stone artefact scatter & historical artefacts.
201607210925	Historical place	776283	8504753	Remains of brick building (smelter).
201607210930	Aboriginal place	776309	8504722	Stone artefact scatter
201607211012	Aboriginal object	776401	8504856	Isolated artefact
201607211040	Aboriginal object	775941	8504503	Isolated artefact
201607211046	Aboriginal object	775952	8504542	Isolated artefact
201607211050	Aboriginal object	775954	8504565	Isolated artefact
201607211100	Aboriginal place	776067	8504674	Stone artefact scatter
201607211140	Historical place	776372	8503993	Brick oven
201607211150	Aboriginal object	776344	8503930	Two isolated artefacts & historical artefacts
201607211215	Aboriginal object	776397	8503901	Knapped bottle glass.
201607211220	Aboriginal object	776413	8504006	Isolated artefact
SLATE QUARRY	Historical place	776066	8504294	Slate quarry
201607211345	Aboriginal place	776039	8504357	Knapping floor and axe quarry
201607211420	Aboriginal place	775953	8504259	Stone artefact scatter
201607211440	Aboriginal place	775905	8504055	Stone artefact scatter
201607220930	Aboriginal place	776033	8500465	Tuff quarry
201607221015	Aboriginal place	775816	8500843	Stone artefact scatter
201607221100	Aboriginal place	775605	8501029	Stone artefact scatter
201607221145	Aboriginal place	776003	8501049	Quarry site
201607221415	Aboriginal object	776206	8501171	Isolated artefact
201607230920	Aboriginal place	773944	8498259	Stone artefact scatter
201607230945	Aboriginal place	773702	8498423	Stone artefact scatter
201607231030	Aboriginal place	772979	8498389	Isolated artefact recorded in very low visibility
201607231100	Aboriginal place	773441	8498034	Stone artefact scatter
201607231125	Aboriginal object	773510	8497953	Isolated artefact
201607231135	Historical object	773582	8497850	Green bottle glass, not knapped.
201607231250	Aboriginal place	773722	8497096	Stone artefact scatter
201607231350	Aboriginal place	773117	8497184	Stone artefact scatter
201607231415	Aboriginal object	773236	8497088	Two isolated artefacts
201607231445	Historical place	773627	8497069	Bottle dump
201607231515	Aboriginal place	772776	8497551	Stone artefact scatter
201607231525	Aboriginal object	772947	8497474	Two isolated artefacts
201607231545	Aboriginal place	772768	8497811	Stone artefact scatter
201608171100	Aboriginal object	750103	8524130	Two isolated artefacts
201608171125	Aboriginal place	749842	8523883	Stone & glass artefact scatter
201607240910	Aboriginal place	192427	8485275	Stone artefact scatter
201607241015	Aboriginal place	192550	8485081	Stone artefact scatter
201607241140	Aboriginal object	192670	8486097	Two isolated artefacts
201607241213	Aboriginal object	192831	8485860	Isolated artefact
201607241235	Aboriginal object	192935	8485763	Isolated artefact
201607241305	Aboriginal place	193149	8485728	Stone artefact scatter, with associated isolates

Table 1: Summary of survey results

7.1 Santorini

The Santorini survey located two isolated artefacts in an existing area of disturbance (eroded vehicle track). As the artefacts had already been disturbed, quite probably before the existence of heritage protection legislation, and because they were at risk of further damage or disturbance if left on the track, the consultant moved the artefacts less than 5m away from the point of discovery to an area of relative safety under a tree.

The survey also located a low density artefact scatter, which comprised both stone and glass tools made by Aboriginal people. The presence of knapped (worked) glass narrows down the possible most recent date of occupation at this site to the contact period (late 19th, early 20th century) and shows that Aboriginal people continued to use traditional economic practices after the arrival of Europeans and Chinese into the district. This site was recorded in conditions of low visibility, and it is highly probable that its boundaries extend beyond the visible limits.

Site Name	Site Type	Easting	Northing	Contents
201608171100	Aboriginal object	750103	8524130	2x tuff flakes, 1 broken. No retouch. 1 eraillure scar. Medially broken
201608171125	Aboriginal place	749842	8523883	Low density artefact scatter. 3x green bottle glass artefacts (knapped), 3x stone artefacts. Retouch on one piece of glass, broken retouched flake, broken unifacial point, flaked piece. Site recorded in low visibility, 20m from costean.

Table 2: Santorini survey results

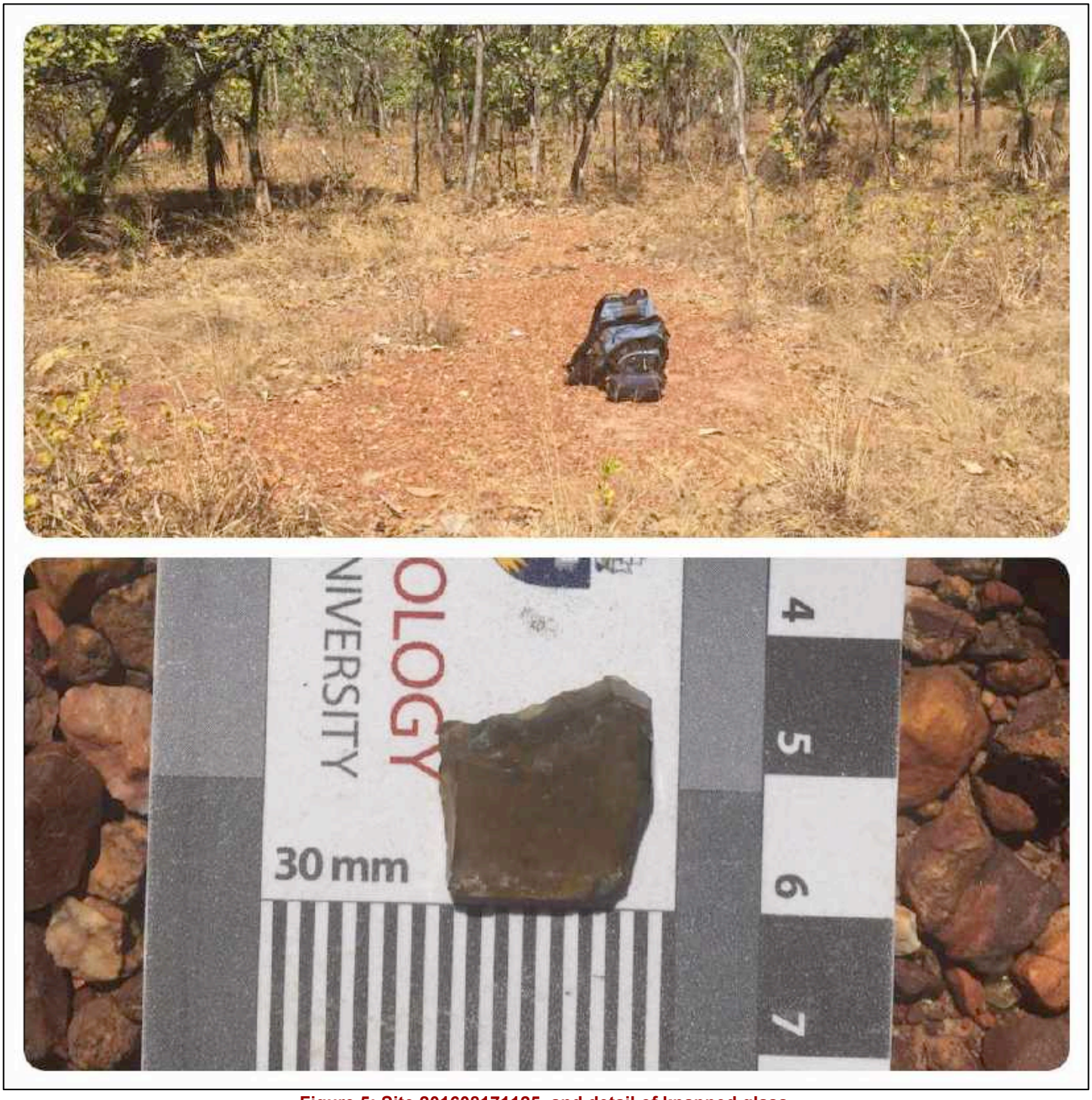

Figure 5: Site 201608171125, and detail of knapped glass

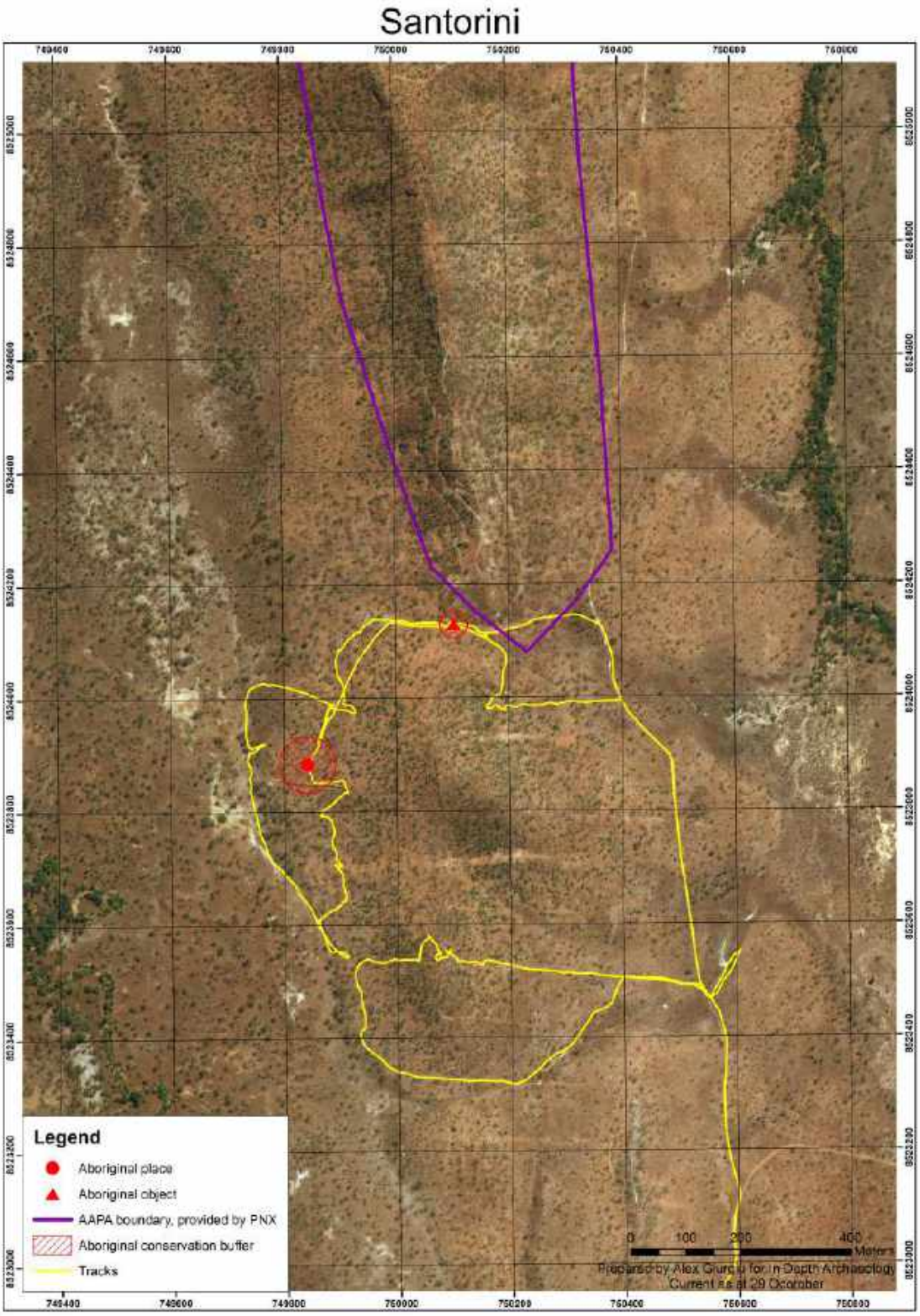

Figure 6: Map of Santorini survey results

7.2 Barossa

The planned drill holes and access track in the Barossa survey area were surveyed in reasonable visibility. No archaeological places or objects were recorded. It is the consultant's assessment that there is low risk of encountering Aboriginal heritage within 100m of the surveyed track.

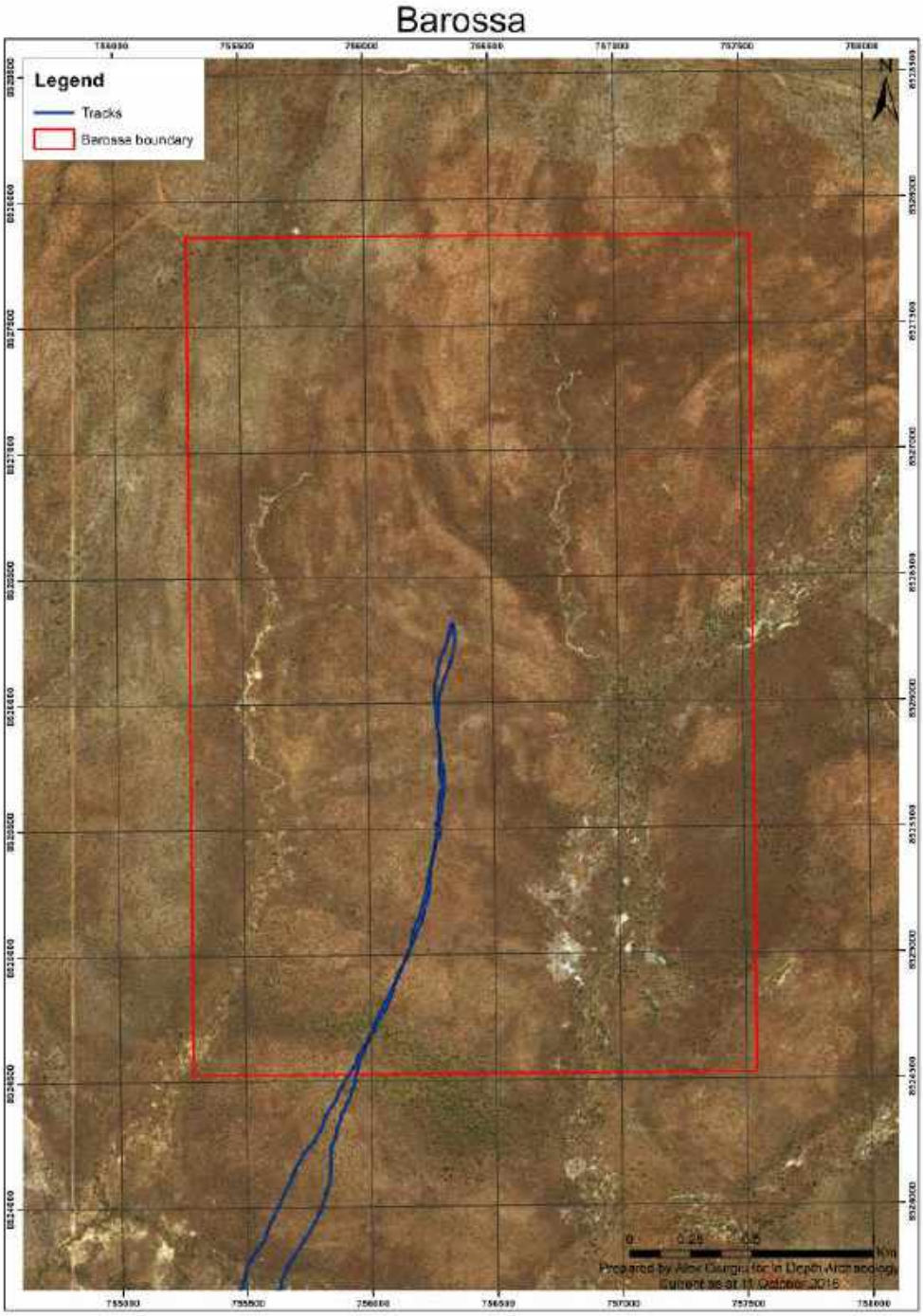

Figure 7: Map of Barossa survey results

7.3 Iron Blow

Iron Blow has been the site of mining and quarrying activity intermittently for over a century. The archaeological survey recorded 5 historical places, 6 Aboriginal places and 7 Aboriginal objects in this survey area (see Table 3 and Figure 8). Historical sites recorded in the survey included a bottle dump, a brick oven, the slate quarry and the remains of brick buildings. The Aboriginal sites included occupation sites on low ridges and hills, plus an axe quarry, and isolated artefacts across the landscape.

In many cases, the historical and Aboriginal sites are located in the same general vicinity, as these areas were valued for the same reasons. A low density stone artefact scatter (201607210900) spreads across a low, flat ridge that is also the location of remnants of brick buildings including a possible smelter (201607210925). The ridge provides access to cooler breezes and proximity to water, lending itself to both historical and Aboriginal occupation. The Aboriginal axe quarry (201607211345) is located immediately above the historical slate quarry. In both instances, the stone was being quarried for economic purposes. One Aboriginal object is a knapped base of a green glass bottle, which was used to create glass tools in the same manner as stone tools (201607211215).

Much of the Iron Blow area has been disturbed by prior mining and exploration activity, as well as fossickers souveniring historical artefacts (eg. see the Grove Hill Hotel museum). However, the integrity of most of the Indigenous sites remains intact, except where noted.

Given the extent of disturbance within the survey area, and the intensity of archaeological survey coverage in conditions of good visibility, the consultant assesses that there is little risk of locating additional Aboriginal places within the Iron Blow survey polygons, however it is possible that isolated artefacts may be found that have not yet been recorded.

Site Name	Site Type	Easting	Northing	Contents
201607210830	Historical place	776125	8504914	Mid to late 20th C bottle dump. Darwin stubbies, other bottles of clear and brown glass. Metal drum lids.
201607210845	Historical place	776258	8504889	Red bricks (30+, broken and whole). Late 19th / early 20th century bottle glass - green, brown. Some bricks in situ, most not.
201607210900	Aboriginal place	776263	8504847	Low density stone artefact scatter amongst historical artefacts. Possible hut site. Bricks, metal, bottle glass, stone artefacts (100+). Flakes, broken flakes, core. 600m from water. Artefacts include 2-platform core, broken. Burrell Creek Formation tuff / greywacke. 55x38x25mm.
201607210925	Historical place	776283	8504753	Concrete slab and hundred of red bricks, possible smelter. Pane and bottle glass, ceramic (insulators?). Heavily disturbed by heavy machinery and fence line.
201607210930	Aboriginal place	776309	8504722	Stone artefact scatter on end of flat low ridge. Disturbed on margins by smelter and heavy machinery. Varied stone artefacts plus broken bottle glass throughout. 200+ artefacts - chert, quartz, tuff. Flake, retouched flake, broken flake, flaked piece, core, blade, unifacial point.
201607211012	Aboriginal object	776401	8504856	Broken tuff flake, unretouched.
201607211040	Aboriginal object	775941	8504503	Tuff blade, unretouched.
201607211046	Aboriginal object	775952	8504542	Tuff flake, retouched on both margins.
201607211050	Aboriginal object	775954	8504565	Broken tuff flake, unretouched. With use wear.
201607211100	Aboriginal place	776067	8504674	Stone artefact scatter on top of high hill. Very stony ground (hard shale). Some disturbance (machinery / drilling). Metal railway sleeper in site. 100+ stone artefacts, max 15/m2. Flakes, broken flake, retouched flake, flaked piece, blade, unifacial point, bifacial point, bipolar percussed blade.
201607211140	Historical place	776372	8503993	Brick oven, practically held together by termite mounds. Red bricks. Associated with original Grove Hill hills, possibly 19th century.
201607211150	Aboriginal object	776344	8503930	Two isolated artefacts, in association with broken glass (green, purple), metal (match tin lid), ceramic (crockery sherd). Long black blade, broken at distal end. No retouch. Plus flaked piece of tuff.
201607211215	Aboriginal object	776397	8503901	Knapped bottle glass. Base of 19th C thick green bottle. Three small flake scars with feather terminations, one with step termination.
201607211220	Aboriginal object	776413	8504006	Tuff flake, unretouched
SLATE QUARRY	Historical place	776066	8504294	Slate quarry
201607211345	Aboriginal place	776039	8504357	Knapping floor and possible quarry for axes. Artefacts include axes, axe blanks, blades, cores, flakes, flaked pieces, etc. Large broken cobbles also present. Site is above historical slate quarry. Minimal disturbance from adjacent quarry. 800+ artefacts.
201607211420	Aboriginal place	775953	8504259	Stone artefact scatter on top of high hill, covers whole ridge of hill. 300+ artefacts, flakes, broken flake, core, retouched flake, flaked piece, axe, axe blank, blade, unifacial point, bifacial point.
201607211440	Aboriginal place	775905	8504055	Low density stone artefact scatter, all tuff. Blades, flakes. Large site, at edge of black soil plain. Site is likely to extend up hill (didn't walk it).

Table 3: Iron Blow survey results

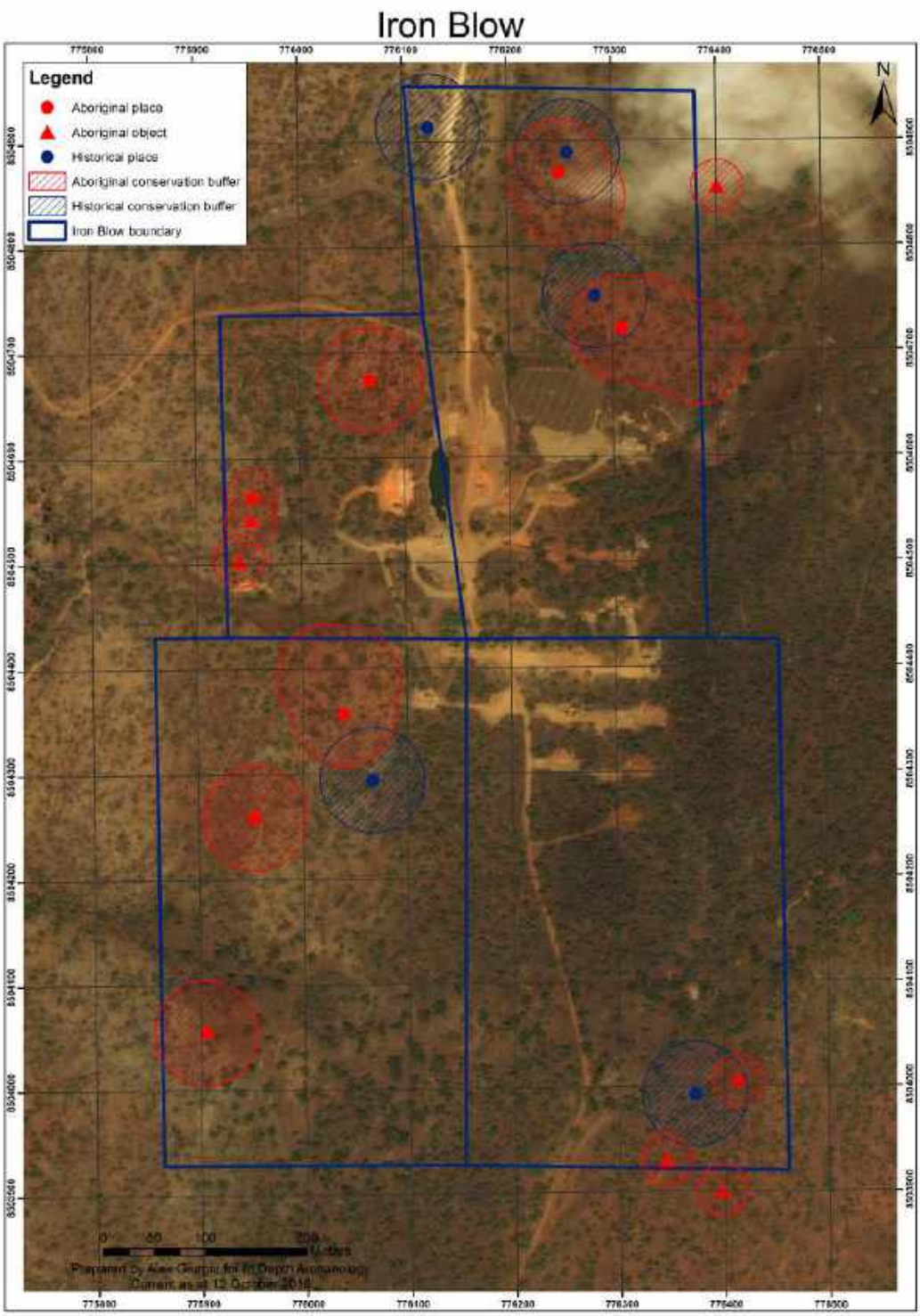

Figure 8: Map of Iron Blow survey results

Figure 9: Site 201607210925 - possible smelter

Figure 10: Historical slate quarry

Figure 11: Site 201607211345 Aboriginal axe quarry, on hill top above historical slate quarry

Figure 12: Site 201607211100 low density artefact scatter, with detail of an axe and a unifacial point

Figure 13: 201607211140 Brick oven and 201607211215 Knapped bottle glass, in the vicinity of the original Grove Hills

7.4 Mount Bonnie

A large Aboriginal quarry site was recorded along a ridge in the Mount Bonnie survey area, containing an estimate of over 5,000 artefacts. This major quarry site was the source of raw material used in the manufacture of axes, blades and flaked artefacts. The site was recorded in conditions of very poor visibility along the ridge top and 100% visibility on the slope, and would benefit from future recording in better visibility. Three other stone artefact scatters were recorded in the area, including another small quarry in a saddle high on Mount Bonnie. One isolated artefact was also recorded.

The Mount Bonnie leases show evidence of extensive mining disturbance, however in undisturbed areas there is evidence for Aboriginal occupation consistent with the broader region. Given the significant extent of disturbance within the leases, the consultant assesses that there is very low risk of further Aboriginal sites within the survey polygons.

Site Name	Site Type	Easting	Northing	Contents
201607220930	Aboriginal place	776033	8500465	Tuff quarry on steep hillside. Visibility 0% at top third of hill. Site extends along whole ridge and down to creek line at base of hill, right at the end of the mining dam. 5,000+ stone artefacts, flake, broken flake, retouched flake, flaked piece, core, axe, blade.
201607221015	Aboriginal place	775816	8500843	Stone artefact scatter on hill top, west of Mount Bonnie. Outcropping shale, but little evidence of quarrying like in site 201607220930. Cores and hammerstones show some evidence of quarrying. 300+ artefacts, all tuff except for quartzite hammerstone. Flake, retouched flake, broken flake, flaked piece, core, axe, hammerstone, blade, bifacial point.
201607221100	Aboriginal place	775605	8501029	Stone artefact scatter on hill top, west of dam wall. 1,000+ artefacts, all tuff. Flake, retouched flake, broken flake, flaked piece, bifacial point.
201607221145	Aboriginal place	776003	8501049	Quarry site in saddle between two rock outcrops on Mount Bonnie. Relatively low density of artefacts, but includes blade cores, axe blanks, flakes, broken flakes, flaked pieces, axe, blade. 300+ artefacts. Site extends down southern slope.
201607221415	Aboriginal object	776206	8501171	Broken tuff blade, retouch on one margin.

Table 4: Mount Bonnie survey results

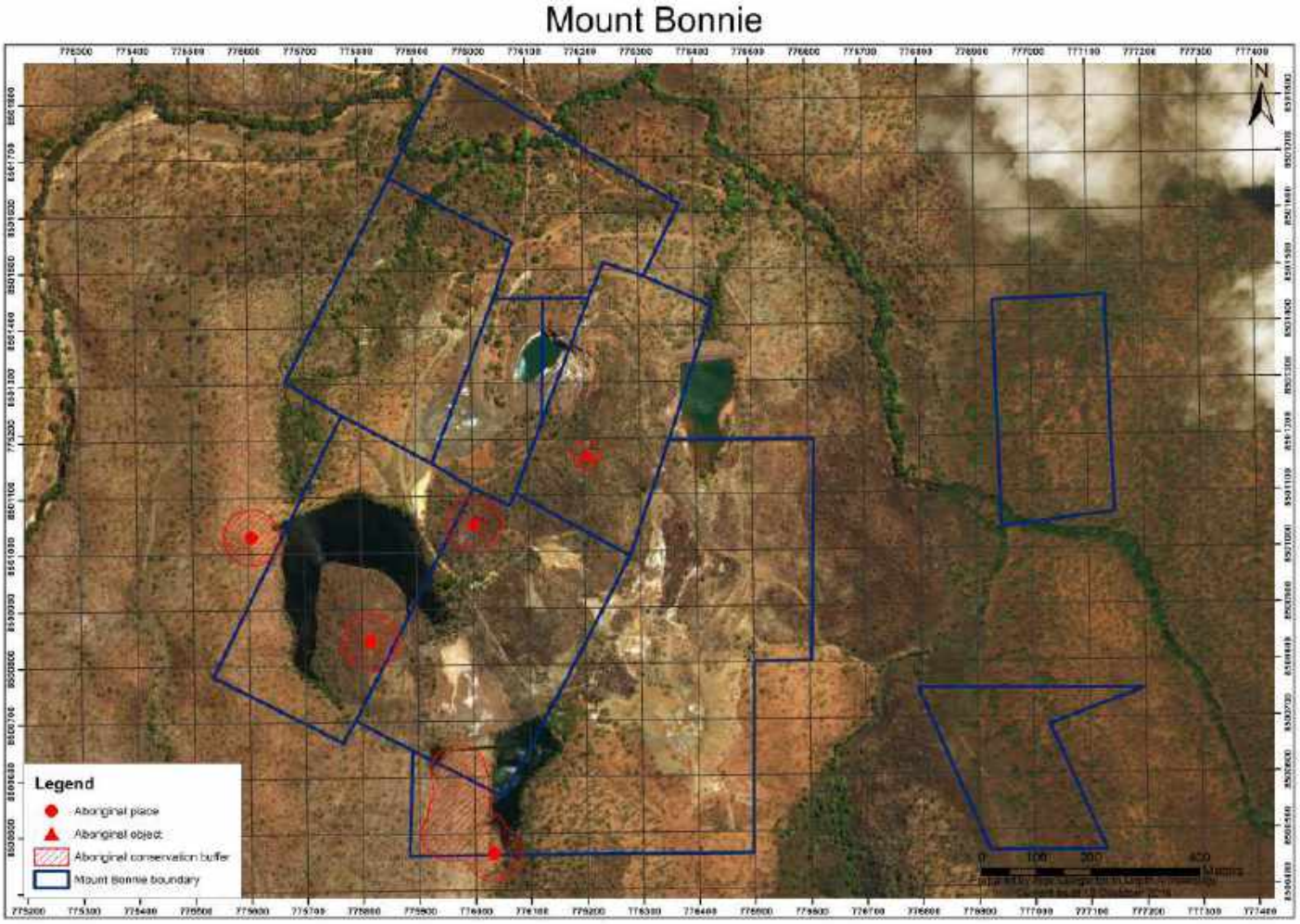

Figure 14: Map of Mount Bonnie survey results

Figure 15: Site 201607220930, showing artefacts scattered on the hill slope and zero visibility on the hill top

Figure 16: Detail of artefacts found in large quarry site 201607220930 - blade (top), blade core (left), axe (right)

Figure 17: Site 201607221015 low density artefact scatter, detail of a hammer stone / grinder (top right)

7.5 Shady Camp

The Shady Camp survey was undertaken in conditions of surface visibility that ranged from 100% to very low (dense vegetation cover). The survey identified 8 Aboriginal sites, 2 isolated Aboriginal artefacts, 1 isolated historical artefact and 1 historical place. The historical heritage included evidence for a hut / outstation, potentially known as the 'Shady Camp' after which the survey area is named. This camp was located on a low rise next to the river, with a large Aboriginal occupation site in the same location (collectively recorded as 201607231250). It was associated with a historical bottle dump (201607231445).

The majority of Aboriginal sites in the Shady Camp survey area were located along ridges and low hills. The consultant assesses that there is a moderate risk of locating further Aboriginal sites and isolated artefacts in the area. Historical mining in the area has caused significant ground disturbance in the northwestern sector of the survey area, however no in situ historical heritage was recorded in this sector. The consultant notes that the heritage-listed site of 'The Shackle' is immediately to the west of the Shady Camp survey area, and this site is afforded the same level of protection under the *Heritage Act* as Aboriginal sites.

Site Name	Site Type	Easting	Northing	Contents
201607230920	Aboriginal place	773944	8498259	Low density artefact scatter across whole ridge top, recorded in low visibility. 30+ artefacts, max 5+/m2. Flakes, retouched flakes, unifacial point, flaked pieces, broken blade. 360 degree views, low ridge surrounded by higher hills. Seasonal creek line below.
201607230945	Aboriginal place	773702	8498423	Low density artefact scatter on low ridge, recorded in very low visibility. Tuff artefacts, flake, flaked piece, retouch flake, broken flake. Needs to be recorded in greater visibility.
201607231030	Aboriginal place	772979	8498389	Isolated artefact recorded in very low visibility, high probability of low density artefact scatter across next two GPS points. Tuff flake, retouched on two margins.
201607231100	Aboriginal place	773441	8498034	Low density artefact scatter on flat top of high ridge, with 360 degree views. Recorded in 100% visibility. 100+ artefacts, scattered: whole flake, broken flake, retouched flake, flaked piece, blade, unifacial point, bifacial point.
201607231125	Aboriginal object	773510	8497953	Bipolar percussed blade, tuff, retouched on two margins
201607231135	Historical object	773582	8497850	Green bottle glass, not knapped.
201607231250	Aboriginal place	773722	8497096	Stone artefact scatter on low rise next to river. Also has remains of 20th C hut / outstation. Corrugated iron, drums, meat safe, etc. Bottle dump 100m west (201607231445). Disturbed by track, fossicking and historical occupation. 1000+ stone artefacts, plus metal, glass and ceramics. Artefacts are clustered and scattered. Tuff and quartz raw materials. Flake, retouched flake, broken flake, flaked piece, core, axe, blade, unifacial point.
201607231350	Aboriginal place	773117	8497184	Low density artefact scatter. 100+ artefacts, tuff. Unifacial points, flakes, flaked piece, broken flakes, retouched flakes, blades.
201607231415	Aboriginal object	773236	8497088	Two tuff flakes on ridge. No retouch.
201607231445	Historical place	773627	8497069	Bottle dump associated with historical site at 201607231250
201607231515	Aboriginal place	772776	8497551	Five tuff flakes / broken flakes on rocky knoll at edge of waste rock disturbance. High probability this is the remains of a site previously disturbed by mining activity, prior to heritage law protection.
201607231525	Aboriginal object	772947	8497474	Broken tuff flake. Flaked piece nearby. Retouch on medial break of broken flake.
201607231545	Aboriginal place	772768	8497811	Low density stone artefact scatter. Disturbed on margins by Langley's mine pit and bulldozed track. 360 degree views. Tuff and quartz artefacts, 500+. Flake, broken flake, retouched flake, flaked piece, blade, unifacial point.

Table 5: Shady Camp survey results

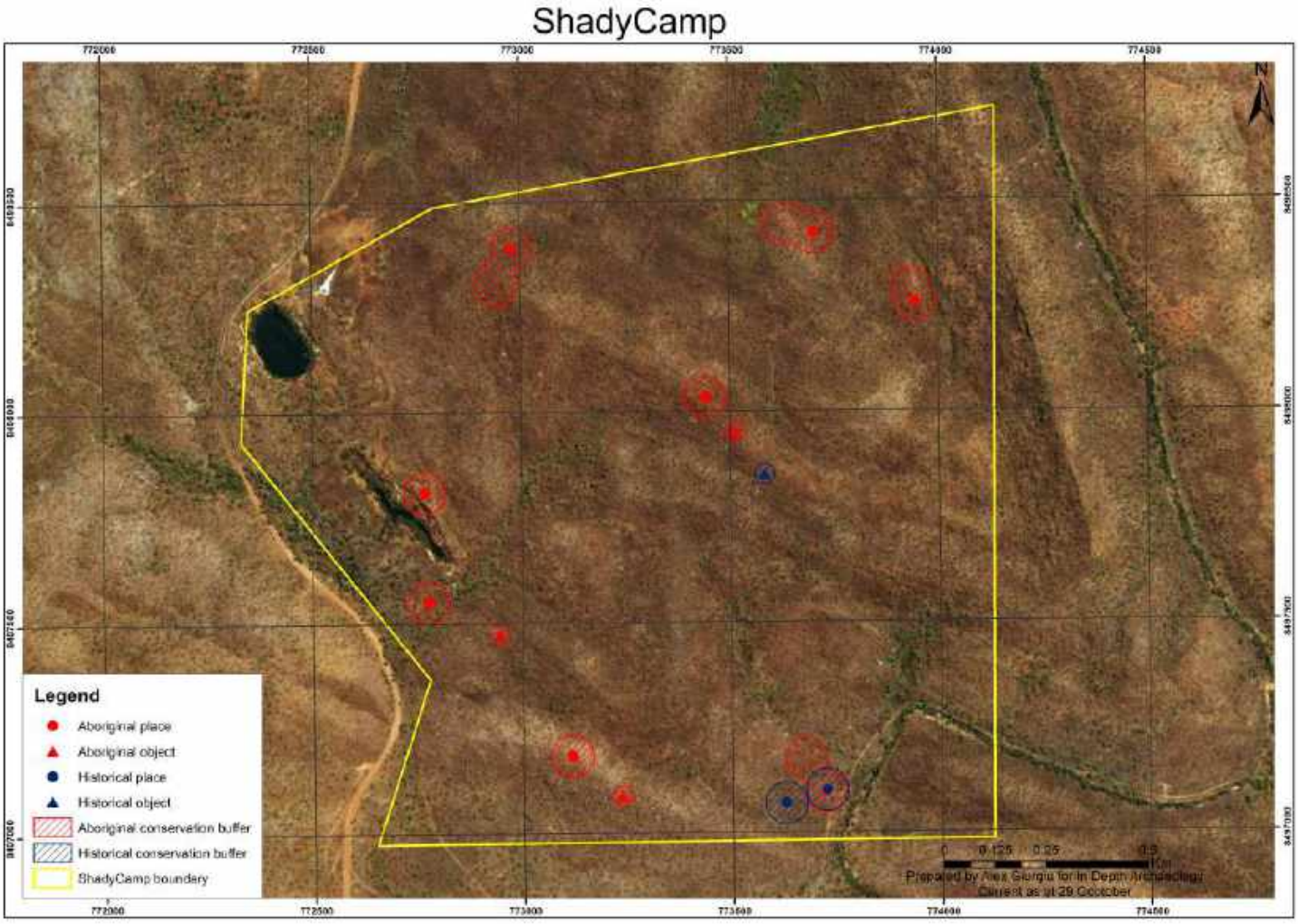

Figure 18: Map of Shady Camp survey results

Figure 19: Historical camp and Aboriginal artefact scatter near the Mary River, site 201607231250

Figure 20: Site 201607231445 Bottle dump associated with historical camp.

Figure 21: Site 201607230945, a low density artefact scatter representative of sites in the Shady Camp survey area

7.6 Moline

Traditional Owner, Bessie Coleman, accompanied the consultant for the Moline survey. Together, they located three Aboriginal sites (low density artefact scatters) and three isolated artefacts. Most of the survey area had good surface visibility, however one hill had very poor surface visibility and high archaeological potential. This hill has been assessed as having a high risk of heritage places or objects (see Fig. 22). There is a low risk of unrecorded heritage places in the remainder of the lease area, and a moderate risk of isolated artefacts.

The low density artefact scatters contained a range of artefact types, indicating general occupation as opposed to sites of specific activity. However, one site (201607241015) contained an uncommonly high proportion of unifacial points and bifacial points, relative to other flaked artefacts. Further research is required to investigate the reasons behind this pattern.

Site Name	Site Type	Easting	Northing	Contents
201607240910	Aboriginal place	192427	8485275	Low density artefact scatter on low rise near seasonal creek. Clustered and scattered artefacts, total 200+, extends at lower density to the north east. Tuff artefacts, flakes, broken flakes, retouched flakes, flaked pieces, blade, unifacial point, bifacial point.
201607241015	Aboriginal place	192550	8485081	Low density artefact scatter. Artefacts are localised, and don't cover entire flat area. Lots of points present, relative to other sites in the region. Old drill hole on western edge of site. 100+ artefacts, tuff. Flake, retouched flake, broken flake, flaked piece, unifacial point, bifacial point.
201607241140	Aboriginal object	192670	8486097	2x tuff broken flakes, no retouch.
201607241213	Aboriginal object	192831	8485860	Tuff blade broken at medial point. No retouch.
201607241235	Aboriginal object	192935	8485763	Tuff flaked piece, no retouch
201607241305	Aboriginal place	193149	8485728	Very low density artefact scatter, with associated isolates. 30+ artefacts across whole slope, tuff and fine grained siliceous. Includes broken blade that lacks prep notch.

Table 6: Moline survey results

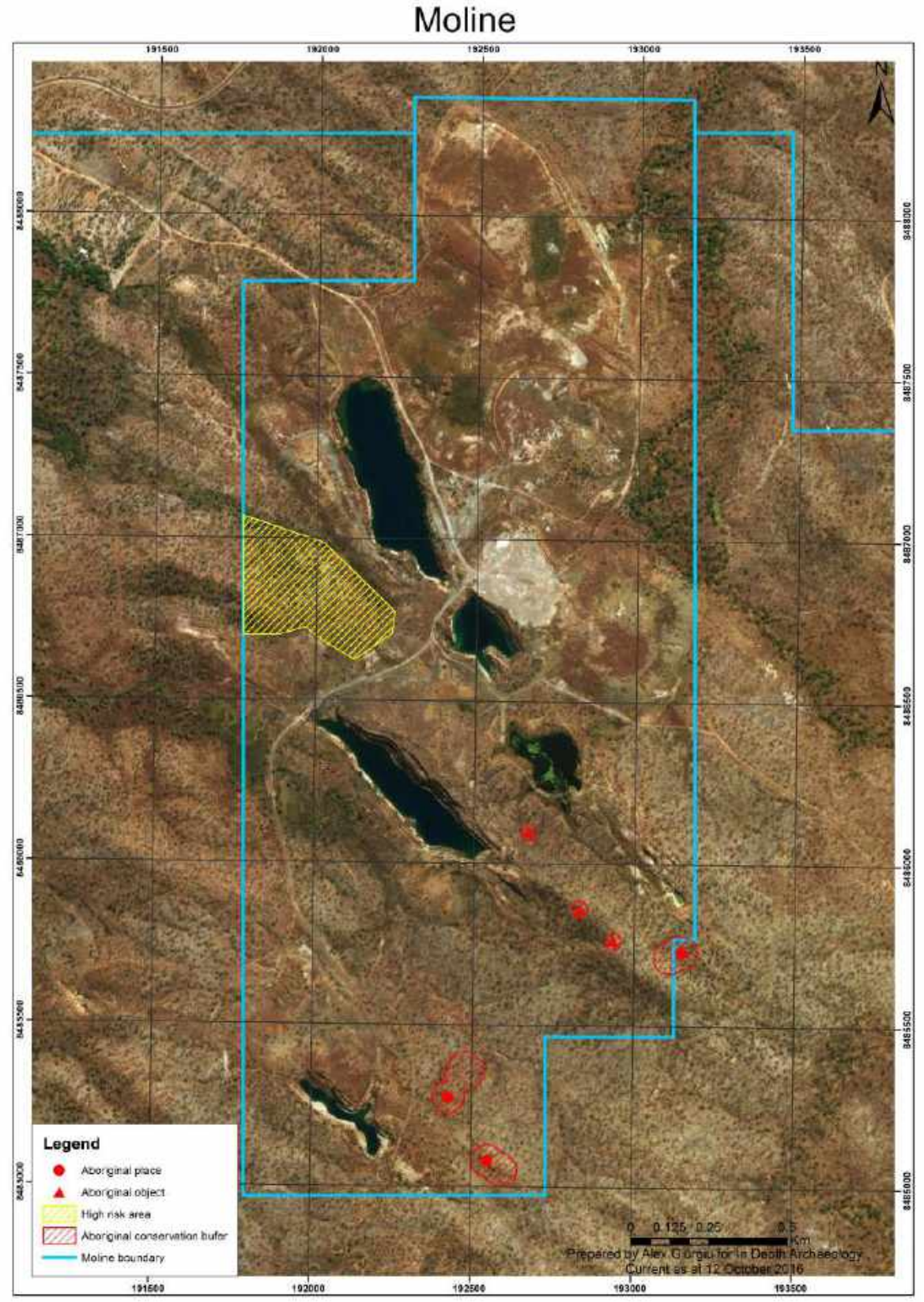

Figure 22: Map of Moline survey results

Figure 23: Traditional Owner, Bessie Coleman, in site 201607241015 - a low density artefact scatter with a high predominance of unifacial and bifacial points

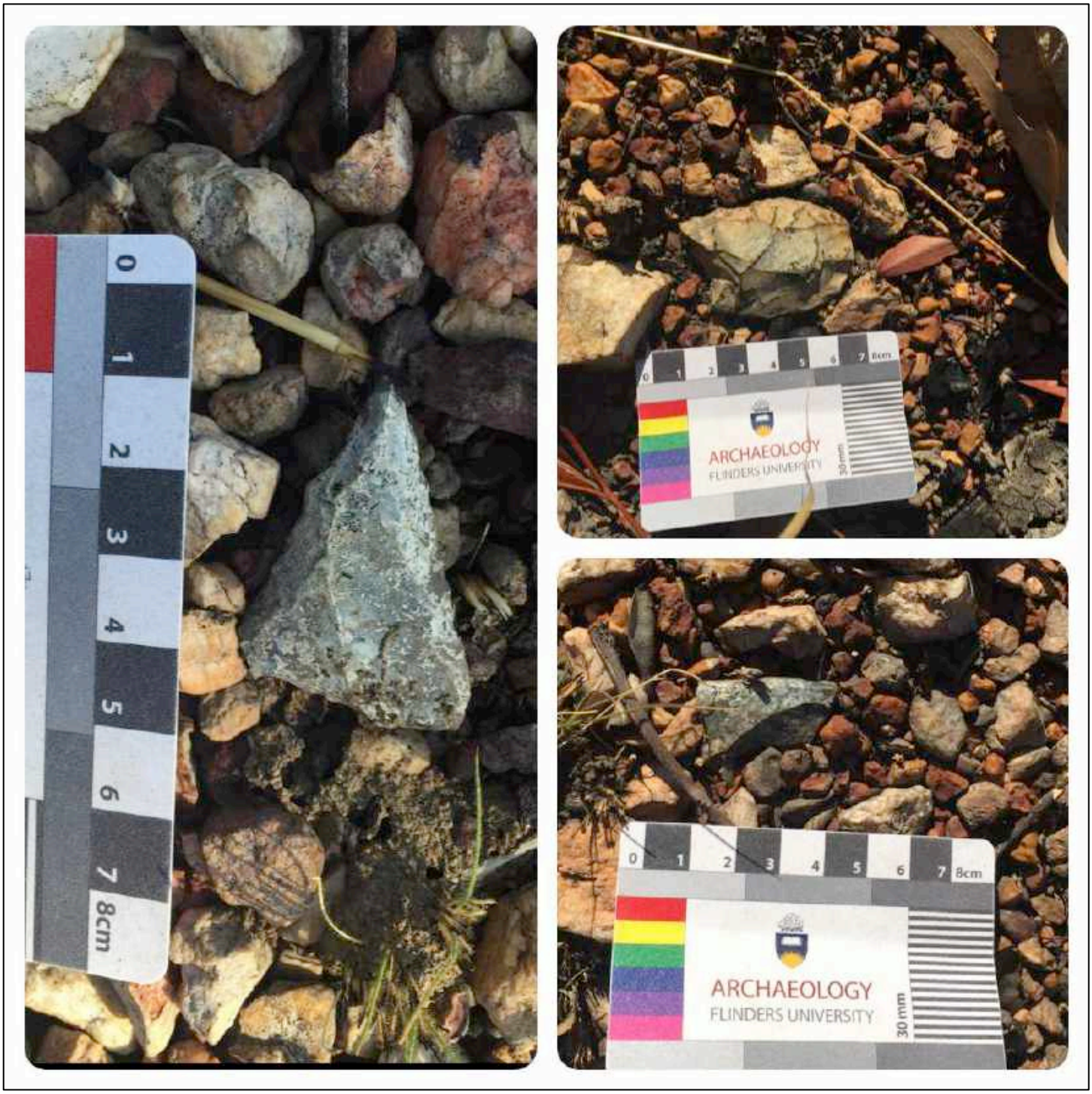

Figure 24: Detail of artefacts from Site 201607240910

7.7 Chessman

The planned drill holes and access track in the Chessman survey area were surveyed in low to reasonable visibility. No archaeological places or objects were recorded. The area has low archaeological prospectivity.

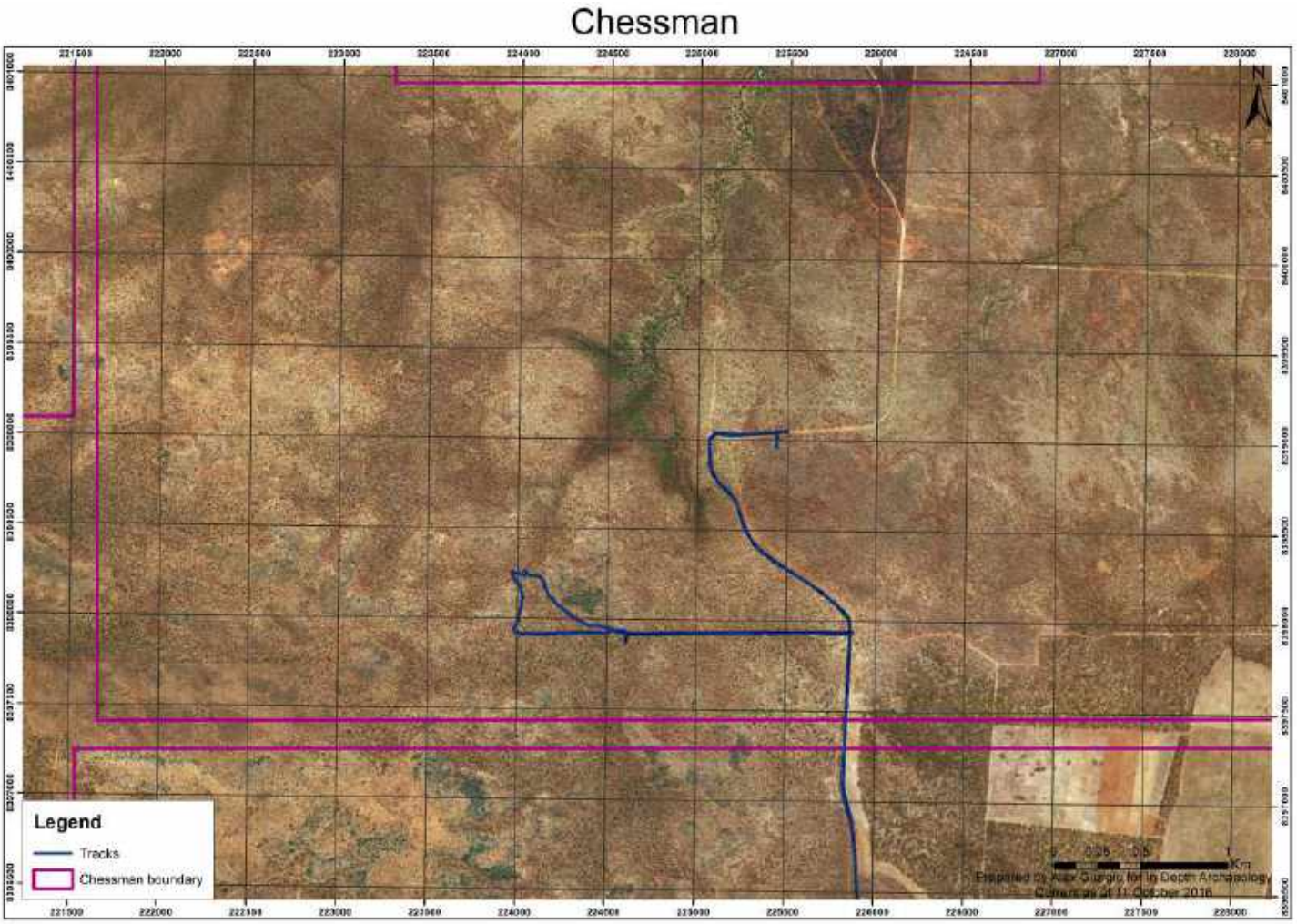

Figure 25: Map of Chessman survey results

8.0 Significance Assessment

8.1 Significance assessment

The assessment of significance of archaeological places and objects is mandated by the *Heritage Act* 2012 and is a highly useful tool in making decisions regarding the management of cultural heritage.

The heritage assessment criteria for a place or object are as follows:

- whether it is important to the course, or pattern, of the Territory's cultural or natural history;
- whether it possesses uncommon, rare or endangered aspects of the Territory's cultural or natural history;
- whether it has potential to yield information that will contribute to an understanding of the Territory's cultural or natural history;
- whether it is important in demonstrating the principal characteristics of a class of cultural or natural places or environments;
- whether it is important in exhibiting particular aesthetic characteristics;
- whether it is important in demonstrating a high degree of creative or technical achievement during a particular period;
- whether it has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons, including the significance of a place to Aboriginal people as part of their continuing and developing cultural traditions; or
- whether it has a special association with the life or works of a person, or group of persons, of importance in the Territory's history.

All archaeological places and objects recorded during the course of surveys are assessed for their significance according to these criteria.

Cultural significance to Traditional Owners is recorded through consultation with Traditional Owner representatives during survey. Sometimes cultural significance and the archaeological significance assessment differ, and the management recommendation takes into account both kinds of significance. For most of the project areas, PNX Metals and the consultant were unable to obtain information from the Northern Land Council as to whom we should approach for consultation. Therefore, the only survey area that has been assessed for cultural significance is Moline. Traditional Owner representative, Bessie Coleman, provided her views on the importance of the sites and artefacts to Traditional Owners of this area.

The summary of significance can be found in Table 7.

Site ID	Site type	Easting	Northing	Archaeological significance	Cultural significance	Recommendation
201607210830	Historical place	776125	8504914	Moderate	Not assessed	Avoid if possible.
201607210845	Historical place	776258	8504889	Moderate	Not assessed	Avoid if possible.
201607211012	Aboriginal object	776401	8504856	Low	Not assessed	Apply 50m conservation buffer zone.
201607220930	Aboriginal place	776033	8500465	High	Not assessed	Apply 100m conservation buffer zone.
201607231135	Historical object	773582	8497850	Low	Not assessed	Avoid if possible.
201607231445	Historical place	773627	8497069	Moderate	Not assessed	Avoid if possible.
201607210900	Aboriginal place	776263	8504847	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607210925	Historical place	776283	8504753	Moderate	Not assessed	Avoid if possible.
201607210930	Aboriginal place	776309	8504722	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607211040	Aboriginal object	775941	8504503	Low	Not assessed	Apply 50m conservation buffer zone.
201607211046	Aboriginal object	775952	8504542	Low	Not assessed	Apply 50m conservation buffer zone.
201607211050	Aboriginal object	775954	8504565	Low	Not assessed	Apply 50m conservation buffer zone.
201607211100	Aboriginal place	776067	8504674	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607211140	Historical place	776372	8503993	Moderate	Not assessed	Avoid if possible.
SLATE QUARRY	Historical place	776066	8504294	Moderate	Not assessed	Avoid if possible.
201607211150	Aboriginal object	776344	8503930	Low	Not assessed	Apply 50m conservation buffer zone.
201607211215	Aboriginal object	776397	8503901	Low	Not assessed	Apply 50m conservation buffer zone.
201607211220	Aboriginal object	776413	8504006	Low	Not assessed	Apply 50m conservation buffer zone.
201607211345	Aboriginal place	776039	8504357	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607211420	Aboriginal place	775953	8504259	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607211440	Aboriginal place	775905	8504055	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607221015	Aboriginal	775816	8500843	Moderate	Not assessed	Apply 100m conservation

	place					buffer zone.
201607221100	Aboriginal place	775605	8501029	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607221145	Aboriginal place	776003	8501049	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607221415	Aboriginal object	776206	8501171	Low	Not assessed	Apply 50m conservation buffer zone.
201607230920	Aboriginal place	773944	8498259	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607230945	Aboriginal place	773702	8498423	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231030	Aboriginal place	772979	8498389	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231100	Aboriginal place	773441	8498034	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231125	Aboriginal object	773510	8497953	Low	Not assessed	Apply 50m conservation buffer zone.
201607231250	Aboriginal place	773722	8497096	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231350	Aboriginal place	773117	8497184	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231415	Aboriginal object	773236	8497088	Low	Not assessed	Apply 50m conservation buffer zone.
201607231515	Aboriginal place	772776	8497551	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607231525	Aboriginal object	772947	8497474	Low	Not assessed	Apply 50m conservation buffer zone.
201607231545	Aboriginal place	772768	8497811	Moderate	Not assessed	Apply 100m conservation buffer zone.
201607240910	Aboriginal place	192427	8485275	Moderate	High	Apply 100m conservation buffer zone.
201607241015	Aboriginal place	192550	8485081	Moderate	High	Apply 100m conservation buffer zone.
201607241140	Aboriginal object	192670	8486097	Low	High	Apply 50m conservation buffer zone.
201607241213	Aboriginal object	192831	8485860	Low	High	Apply 50m conservation buffer zone.
201607241235	Aboriginal object	192935	8485763	Low	High	Apply 50m conservation buffer zone.
201607241305	Aboriginal place	193149	8485728	Moderate	High	Apply 100m conservation buffer zone.
201608171100	Aboriginal object	750103	8524130	Low	Not assessed	Apply 50m conservation buffer zone.
201608171125	Aboriginal place	749842	8523883	Moderate	Not assessed	Apply 100m conservation buffer zone.

Table 7: Summary of significance assessment of heritage places and objects

8.2 Discussion of significance assessment

The location of archaeological sites recorded in the 2016 survey conformed to previous patterning of sites recorded across the Pine Creek Geosyncline region.

The large quarry site in the Mount Bonnie survey area has been assessed as having high archaeological significance, as it meets a number of criteria (or 'values') under the Burra Charter for heritage assessment (Pearson & Sullivan, 1999). This site has scientific value, as it can inform us about the past lifeways of Indigenous people. It is important to the course of the Northern Territory's cultural history and has potential to contribute further to our understanding of this cultural history, by providing insight into the large-scale manufacturing and trade of artefacts from the region. Initial assessments of sites in the region show evidence for a manufacturing tradition on an industrial scale and trade across vast distances, at odds with the colonial assumption of Aboriginal economy as local subsistence. Site 201607220930 has significant potential to contribute to further research on this subject.

The other Aboriginal sites and historical places recorded during the survey have been assessed as having moderate archaeological significance. Individually and collectively, these archaeological places demonstrate the principal characteristics of these site types, and therefore can inform us about the lives of Indigenous people and historical mining communities in the Top End.

The Aboriginal objects and historical object have been assessed as having low archaeological significance. Individually and collectively, they provide information about technological achievements, resource use and landscape use in the region.

It is important to note that in prior consultation with Bessie Coleman and other Traditional Owners of the Top End, many have expressed the significance of the NT's mining heritage to Aboriginal people. They do not feel excluded from this mining heritage, as many of their parents, grandparents, other forebears and even Bessie herself, worked in the mines with European, Chinese and other cultural groups. Therefore, while the historic heritage does not have presumptive protection under the *Heritage Act* in line with Aboriginal heritage, it is often considered to be equally significant to Traditional Owners.

9.0 Recommendations

The survey recorded 44 heritage places and objects, as defined under the *Heritage Act* 2012. The consultant makes the following recommendations:

- That the client avoids disturbance of the high risk area identified in the Moline prospect, until such time as an archaeological survey can be undertaken in conditions of higher visibility.
- That a 100m conservation buffer zone be placed over all identified Aboriginal places.
- That a 50m conservation buffer zone be placed over all identified Aboriginal objects.
- That historical places and objects be avoided if possible during the course of works.
- That if staff or contractors encounter suspected Aboriginal heritage materials during the course of works, disturbance of the area should cease and further advice be sought from the consultant.
- That the client continues to provide a cultural heritage induction to all staff and contractors working in the area upon commencement of work.
- That the client maintains currency of all Authority Certificates in relation to sacred sites in the area. Queries about sacred sites should be directed to the Aboriginal Areas Protection Authority.

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Protocol for reported finds of skeletal remains
December 2012

In the case of any skeletal material suspected of being of human origin being brought to the notice of the Police as a result of:

- natural erosion or ground movement
- general earthworks including; mining, agricultural work and road building
- bones being handed to authorities
- archaeological exploration
- being simply located in a previously concealed situation

Where nothing of a suspicious nature is evident, and the material may be of Traditional Aboriginal origin, the Police will:

- Endeavour to ensure that the site or immediate area is not further disturbed until the attendance of experts
- Contact both the Aboriginal Areas Protection Authority (AAPA) and the Heritage Branch, and advise:

    - the location of the discovery (GPS)
    - features of the site
    - police in charge
    - any other relevant information – i.e. images

AAPA will:

- Advise if the location is within a sacred site, or a known burial ground, and provide authorisation to enter if it is a sacred site
- Advise if the Authority has any record of burials within that sacred site, or at the location in question
- Advise to the best of AAPA's knowledge who the relevant custodians are

The Heritage Branch will:

- Consult with custodians
- Assess the remains and decide on appropriate action in accordance with the *Heritage Act*, seeking expert advice as necessary.

Where AAPA or the Heritage Branch are the first to be made aware of the existence of human skeletal remains they will advise the Officer in Charge of the nearest police station at the earliest opportunity.

CONTACT DETAILS:

Ben Scambary, CEO of AAPA: 0417 875624

Michael Wells, Director Heritage Branch: 0439 500480

The Vermillion Accord on Human Remains

Adopted in 1989 at World Archaeological Congress Inter-Congress, South Dakota, USA.

1. Respect for the mortal remains of the dead shall be accorded to all, irrespective of origin, race, religion, nationality, custom and tradition.

2. Respect for the wishes of the dead concerning disposition shall be accorded whenever possible, reasonable and lawful, when they are known or can be reasonably inferred.

3. Respect for the wishes of the local community and of relatives or guardians of the dead shall be accorded whenever possible, reasonable and lawful.

4. Respect for the scientific research value of skeletal, mummified and other human remains (including fossil hominids) shall be accorded when such value is demonstrated to exist.

5. Agreement on the disposition of fossil, skeletal, mummified and other remains shall be reached by negotiation on the basis of mutual respect for the legitimate concerns of communities for the proper disposition of their ancestors, as well as the legitimate concerns of science and education.

6. The express recognition that the concerns of various ethnic groups, as well as those of science are legitimate and to be respected, will permit acceptable agreements to be reached and honoured.

V. MODEL PROTOCOL FOR DISINTERMENT AND ANALYSIS OF SKELETAL REMAINS

A. Introduction

This proposed model protocol for the disinterment and analysis of skeletal remains includes a comprehensive checklist of the steps in a basic forensic examination. The objectives of an anthropological investigation are the same as those of a medicolegal investigation of a recently deceased person. The anthropologist must collect information that will establish the identity of the deceased, the time and place of death, the cause of death and the manner or mode of death (homicide, suicide, accident or natural). The approach of the anthropologist differs, however, because of the nature of the material to be examined. Typically, a prosector is required to examine a body, whereas an anthropologist is required to examine a skeleton. The prosector focuses on information obtained from soft tissues, whereas the anthropologist focuses on information from hard tissues. Since decomposition is a continuous process, the work of both specialists can overlap. An anthropologist may examine a fresh body when bone is exposed or when bone trauma is a factor. An experienced prosector may be required when mummified tissues are present. In some circumstances, use of both this protocol and the model autopsy protocol may be necessary to yield the maximum information. The degree of decomposition of the body will dictate the type of investigation and, therefore, the protocol(s) to be followed.

The questions addressed by the anthropologist differ from those pursued in a typical autopsy. The anthropological investigation invests more time ant attention to basic questions such as the following:

(a) Are the remains human?
(b) Do they represent a single individual or several?
(c) What was the decedent's sex, race, stature, body weight, handedness and physique?
(d) Are there any skeletal traits or anomalies that could serve to positively identify the decedent?

The time, cause and manner of death are also addressed by the anthropologist, but the margin of error is usually greater than that which can be achieved by an autopsy shortly after death.

This model protocol may be of use in many diverse situations. Its application may be affected, however, by poor conditions, inadequate financial resources or lack of time. Variation from the protocol may be inevitable or even preferable in some cases. It is suggested, however, that any major deviations, with the supporting reasons, should be noted in the final report.

B. Proposed model skeletal analysis protocol
1. Scene investigation

A burial recovery should be handled with the same exacting care given to a crime-scene search. Efforts should be co-ordinated between the principal investigator and

the consulting physical anthropologist or archaeologist. Human remains are frequently exhumed by law enforcement officers or cemetery workers unskilled in the techniques of forensic anthropology. Valuable information may be lost in this manner and false information is sometimes generated. Disinterment by untrained persons should be prohibited. The consulting anthropologist should be present to conduct or supervise the disinterment. Specific problems and procedures accompany the excavation of each type of burial. The amount of information obtained from the excavation depends on knowledge of the burial situation and judgement based on experience. The final report should include a rationale for the excavation procedure.

The following procedure should be followed during disinterment:

(a) Record the date, location, starting and finishing times of the disinterment, and the names of all workers;

(b) Record the information in narrative form, supplemented by sketches and photographs;

(c) Photograph the work area from the same perspective before work begins and after it ends every day to document any disturbance not related to the official procedure;

(d) In some cases, it is necessary to first locate the grave within a given area. There are numerous methods of locating graves, depending on the age of the grave:

> (i) An experienced archaeologist may recognize clues such as changes in surface contour and variation in local vegetation;
>
> (ii) A metal probe can be used to locate the less compact soil characteristics of grave fill;
>
> (iii) The area to be explored can be cleared and the top soil scraped away with a flat shovel. Graves appear darker than the surrounding ground because the darker topsoil has mixed with the lighter subsoil in the grave fill. Sometimes a light spraying of the surface with water may enhance a grave's outline;

(e) Classify the burial as follows:

> (i) Individual or commingled. A grave may contain the remains of one person buried alone, or it may contain the commingled remains of two or more persons buried either at the same time or over a period of time;
>
> (ii) Isolated or adjacent. An isolated grave is separate from other graves and can be excavated without concern about encroaching upon another grave. Adjacent graves, such as in a crowded cemetery, require a different excavation technique because the wall of one grave is also the wall of another grave;
>
> (iii) Primary or secondary. A primary grave is the grave in which the deceased is first placed. If the remains are then removed and reburied, the grave is considered to be secondary;

(iv) Undisturbed or disturbed. An undisturbed burial is unchanged (except by natural processes) since the time of primary burial. A disturbed burial is one that has been altered by human intervention after the time of primary burial. All secondary burials are considered to be disturbed; archaeological methods can be used to detect a disturbance in a primary burial;

(f) Assign an unambiguous number to the burial. If an adequate numbering system is not already in effect, the anthropologist should devise a system;

(g) Establish a datum point, then block and map the burial site using an appropriate-sized grid and standard archaeological techniques. In some cases, it may be adequate simply to measure the depth of the grave from the surface to the skull and from the surface to the feet. Associated material can then be recorded in terms of their position relative to the skeleton;

(h) Remove the overburden of earth, screening the dirt for associated materials. Record the level (depth) and relative co-ordinates of any such findings. The type of burial, especially whether primary or secondary, influences the care and attention that needs to be given to this step. Associated materials located at a secondary burial site are unlikely to reveal the circumstances of the primary burial but may provide information on events that have occurred after that burial;

(i) Search for items such as bullets or jewelry, for which a metal detector can be useful, particularly in the levels immediately above and below the level of the remains;

(j) Circumscribe the body, when the level of the burial is located, and, when possible, open the burial pit to a minimum of 30 cm on all sides of the body;

(k) Pedestal the burial by digging on all sides to the lowest level of the body (approximately 30 cm). Also pedestal any associated artifacts;

(l) Expose the remains with the use of a soft brush or whisk broom. Do not use a brush on fabric, as it may destroy fibre evidence. Examine the soil found around the skull for hair. Place this soil in a bag for laboratory study. Patience is invaluable at this time. The remains may be fragile, and interrelationships of elements are important and may be easily disrupted. Damage can seriously reduce the amount of information available for analysis;

(m) Photograph and map the remains in situ. All photographs should include an identification number, the date, a scale and an indication of magnetic north;

(i) First photograph the entire burial, then focus on significant details so that their relation to the whole can be easily visualized;

(ii) Anything that seems unusual or remarkable should be photographed at close range. Careful attention should be given to evidence of trauma or pathological change, either recent or healed;

(iii) Photograph and map all associated materials (clothes, hair, coffin, artifacts, bullets, casings etc.). The map should include a rough sketch of the skeleton as well as any associated materials;

(n) Before displacing anything, measure the individual:

(i) Measure the total length of the remains and record the terminal points of the measurement, e.g. apex to plantar surface of calcaneus (note: This is not a stature measurement);

(ii) If the skeleton is so fragile that it may break when lifted, measure as much as possible before removing it from the ground;

(o) Remove all elements and place them in bags or boxes, taking care to avoid damage. Number, date and initial every container;

(p) Excavate and screen the level of soil immediately under the burial. A level of "sterile" (artifact-free) soil should be located before ceasing excavation and beginning to backfill.

2. Laboratory analysis of skeletal remains

The following protocol should be followed during the laboratory analysis of the skeletal remains:

(a) Record the date, location, starting and finishing times of the skeletal analysis, and the names of all workers;

(b) Radiograph all skeletal elements before any further cleaning:

(i) Obtain bite-wing, apical and panoramic dental X-rays, if possible;

(ii) The entire skeleton should be X-rayed. Special attention should be directed to fractures, developmental anomalies and the effects of surgical procedures. Frontal sinus films should be included for identification purposes;

(c) Retain some bones in their original state; two lumbar vertebrae should be adequate. Rinse the rest of the bones clean but do not soak or scrub them. Allow the bones to dry;

(d) Lay out the entire skeleton in a systematic way:

(i) Distinguish left from right;

(ii) Inventory every bone and record on a skeletal chart;

(iii) Inventory the teeth and record on a dental chart. Note broken, carious, restored and missing teeth;

(iv) Photograph the entire skeleton in one frame. All photographs should contain an identification number and scale;

(e) If more than one individual is to be analysed, and especially if there is any chance that comparisons will be made between individuals, number every element with indelible ink before any other work is begun;

(f) Record the condition of the remains, e.g. fully intact and solid, eroding and friable, charred or cremated;

(g) Preliminary identification:

(i) Determine age, sex, race and stature;

(ii) Record the reasons for each conclusion (e.g. sex identity based on skull and femoral head);

(iii) Photograph all evidence supporting these conclusions;

(h) Individual identification:

(i) Search for evidence of handedness, pathological change, trauma and developmental anomalies;

(ii) Record the reasons for each conclusion;

(iii) Photograph all evidence supporting these conclusions;

(i) Attempt to distinguish injuries resulting from therapeutic measures from those unrelated to medical treatment. Photograph all injuries:

(i) Examine the hyoid bone for cracks or breaks;

(ii) Examine the thyroid cartilage for damage;

(iii) Each bone should be examined for evidence of contact with metal. The superior or inferior edges of the ribs require particular scrutiny. A dissecting microscope is useful;

(j) If the remains are to be reburied before obtaining an identification, retain the following samples for further analysis:

(i) A mid-shaft cross-section from either femur, 2 cm or more in height;

(ii) A mid-shaft cross-section from either fibula, 2 cm or more in height;

(iii) A 4-cm section from the sternal end of a rib (sixth, if possible);

(iv) A tooth (preferably a mandibular incisor) that was vital at the time of death;

(v) Several molar teeth for possible later deoxyribonucleic acid fingerprinting for identification;

(vi) A cast of the skull for possible facial reconstruction;

(vii) Record what samples have been saved, and label all samples with the identification number, date and name of the person who removed the sample.

3. Final report

The following steps should be taken in the preparation of a final report:
(a) Prepare a full report of all procedures and results;
(b) Include a short summary of the conclusions;
(c) Sign and date the report.

4. Repository for evidence

In cases where the body cannot be identified, the exhumed remains or other evidence should be preserved for a reasonable time. A repository should be established to hold the bodies for 5-10 years in case they can be identified at a later time.