

NELSON PLAINS TIN TUNGSTEN R41S EXPLORATION SITE.

ABORIGINAL HERITAGE INVESTIGATION REPORT.

FOR BALFOUR MANAGEMENT PTY
LTD.



By Jim Wheeler & Alyssa Gilchrist.

March 2010

AHMS

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REPORT PREPARED FOR BALFOUR MANAGEMENT PTY LTD

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ABBREVIATIONS

AHC	Australian Heritage Council
AHO	Aboriginal Heritage Officer
AHT	Aboriginal Heritage Tasmania
AHIR	Aboriginal Heritage Investigation Report
ARA	Aboriginal Relics Act 1975
CHL	Commonwealth Heritage List
DEH	Department of Environment and Heritage
EPBC	Environment Protection and Biodiversity Conservation
GDA	Geocentric Datum Australia
GSV	Ground surface visibility
ICOMOS	International Council on Monuments and Sites
TALCS	Tasmanian Aboriginal Land & Sea Council
TASI	Tasmanian Aboriginal Site Index
LGA	Local Government Area
MGA	Map Grid of Australia - unless otherwise specified all coordinates are in MGA
NHL	National Heritage List
NNTT	National Native Title Tribunal
RNE	Register of the National Estate

ABSTRACT (EXECUTIVE SUMMARY)

Balfour Management Pty Ltd engaged Archaeological and Heritage Management Solutions (AHMS) Pty Ltd to undertake an Aboriginal heritage investigation for proposed tin-tungsten exploration at the R41S prospect on the Nelson River Plains in north-western Tasmania. The subject land is located to the south of Rebecca Road, approximately 12 kilometres inland from the Temma on the west coast of Tasmania.

The Balfour Joint Venture (BJV) are exploring for Tin-Tungsten deposits within Precambrian sediments on the North West Coast of Tasmania. As part of the exploration programme, BJV plan to test a coincident gravity magnetic anomaly named R41S. It is the R41S prospect that is the subject of this assessment report.

The proposed activity will entail mobilising and walking a Boart Longyear track mounted LF90 diamond drill rig across approximately 2 kms of button grass plain to the R41S exploration area. The rig will be used to excavate a series of drill holes within the exploration area.

The purpose of this study is to assess the impact of proposed development on Aboriginal sites, objects and Aboriginal cultural heritage values. The objective of the study is to provide recommendations for management and mitigation of impact on Aboriginal heritage prior to and during development. The study is also designed to satisfy Aboriginal Heritage Tasmania (AHT) requirements for assessment and management of Aboriginal heritage.

As part of study, we engaged Aboriginal Heritage Officer Leigh Maynard to assist with the investigation and to liaise with relevant Aboriginal stakeholders to determine whether or not the proposed activity area has cultural significance to the Aboriginal community. The report by Maynard is included in Appendix 1 to this report, which includes a discussion of the views of the Aboriginal community regarding the proposed activity and their recommendations for management.

A search for known Aboriginal sites on the TASI site register was undertaken to identify previously recorded sites within and surrounding the study area. A total of 249 sites have been recorded within 10km of the study area. Most of these sites are

artefact scatters and quarries, with middens found along the coastal fringe. One site is recorded in close proximity to the study area.

Based upon our analysis of the TASI Aboriginal sites database, and background archaeological data reviewed as part of our desktop assessment work, we made the following predictions:

- There is some potential for spongolite artefact scatters and sub-surface deposits on the interface between the tall forest and the button grass plain (particularly within 400 metres of the forest edge). Such sites are likely to reflect primary reduction of spongolite source material extracted nearby in the forest;
- There is some potential for small artefact scatters and sub-surface deposits on dry land surfaces in close proximity to permanent water sources on the button grass plain. Such sites are likely to reflect occasional, low intensity, short stay use; and
- Areas on the button grass plain further away from the forest and permanent water have a very low potential for artefact scatters or sub-surface deposits. Any evidence in these areas is likely to be very sparse and consistent with transitory use and discard.

A survey of the proposed activity area was undertaken by on the 11th March 2010. A subsequent inspection of the study area was carried out by Leigh Maynard (Aboriginal Heritage Officer) on the 12th March 2010.

No Aboriginal sites or objects were found during the survey. Ground surface visibility was very poor, particularly on the button grass plain. This had an impact on the effectiveness of the survey in identifying surface archaeological sites.

Drawing on the results of our predictive modelling and the results of survey, we made the following conclusion regarding archaeological sites and potential archaeological sites in the study area:

- There is little to no potential for intact archaeological sites on the old 4WD tracks running off Rebecca Road due to the level of prior disturbance.

- The results of previous investigations in the region and our predictive modelling suggest that there is moderate potential that spongolite primary reduction sites may be found within close proximity to the tall forest.
- There is very low potential for archaeological sites across the remainder of survey unit 1 because this part of the moorland plain not contain any reliable permanent sources of water. In addition, previous studies indicate Aboriginal use of the hinterland button grass plains was transitory and sporadic.
- There is a low potential for archaeological sites on the low crest landforms in survey unit 2 for the same reasons described above. The potential on the crest is assessed as slightly higher than the moorland plain because the crests have a more diverse suite of vegetation resources, quartz raw material resources and the lower, thinner vegetation on the crests is more conducive for transit and for camping.

An impact assessment was used to determine appropriate recommendations for managing Aboriginal heritage risks during the proposed activity. An abridged summary of the recommendations is as follows:

1. Recommends no further archaeological investigations are warranted in advance of the proposed exploration programme;
2. Recommends drill rig access into the R41S exploration area should utilise the existing eastern 4WD track off Rebecca Road and, where possible, should avoid crossing low crest landforms;
3. Recommends Balfour Management Pty Ltd should consider engaging a suitably qualified archaeologist and Aboriginal Heritage Officer to inspect the drill rig access path and examine a sample of soil columns excavated at drill sites on the crest and plain landforms. The aims would be to identify any Aboriginal archaeological deposits exposed by the drill rig transit and to gauge the likely potential for intact sub-surface archaeological deposits in the R41S area. The objective of this work would be to provide a higher level of risk assurance for any future tin tungsten extraction operation;
4. Recommends a stop work procedure for discovery of Aboriginal sites or objects during the activity;

5. Recommends a stop work procedure for discovery of Aboriginal burials during the activity; and
6. Recommends two copies of this report should be sent to Aboriginal Heritage Tasmania.

DRAFT

1 INTRODUCTION

1.1 Preamble

Balfour Management Pty Ltd engaged *Archaeological and Heritage Management Solutions (AHMS) Pty Ltd* to undertake an Aboriginal heritage investigation report (AHIR) for proposed tin tungsten exploration work south of Rebecca Road on the Nelson River Plains in northwestern Tasmania.

1.2 Site identification

The subject land is located to the south of Rebecca Road on the Nelson River Plains, approximately 12 kilometres inland from the Temma on the west coast of Tasmania (Figure 1). The study area is located within the Arthur-Pieman protected area on the button grass plain.

The study area comprises a proposed 2km drill rig access route from Rebecca Road to the proposed exploration area (Figure 2).

1.3 Reasons for the current study

The Balfour Joint Venture (BJV) are exploring for Tin-Tungsten deposits within Precambrian sediments on the North West Coast of Tasmania. The BJV is an agreement between King Island Scheelite Ltd (KIS) and Pleiades Resources Pty Ltd (PRPL) whereby KIS fund an exploration-drilling program focussed on the Specimen Hill Sn mineralisation near Balfour. In addition to the Specimen Hill Program, the BJV plan to test a coincident gravity magnetic anomaly named R41S. It is the R41S prospect that is the subject of this assessment report.

The proposed activity will entail mobilising and walking a Boart Longyear track mounted LF90 diamond drill rig across approximately 2 kms of button grass plain to the R41S exploration area (see Figure 2). A total of six return trips over the plain are envisaged, three to mobilise the rig, drill sloop, fuel and equipment and three to demobilise. A series of drill holes will be excavated within the exploration area.

The work program (drill hole and access) was forwarded to the MEWG on the 11th November 2009. Balfour Joint Venture then received advice from Aboriginal

Heritage Tasmania (AHT) that an Aboriginal Heritage Investigation must be undertaken by a suitably qualified Consulting Archaeologist to ensure that the proposed works do not transgress the *Aboriginal Relics Act 1975*.

The purpose of this study is to assess the impact of proposed development on Aboriginal sites, objects and Aboriginal cultural heritage values. The objective of the study is to provide recommendations for management and mitigation of impact on Aboriginal heritage prior to and during development. The study is also designed to satisfy Aboriginal Heritage Tasmania (AHT) requirements for assessment and management of Aboriginal heritage.

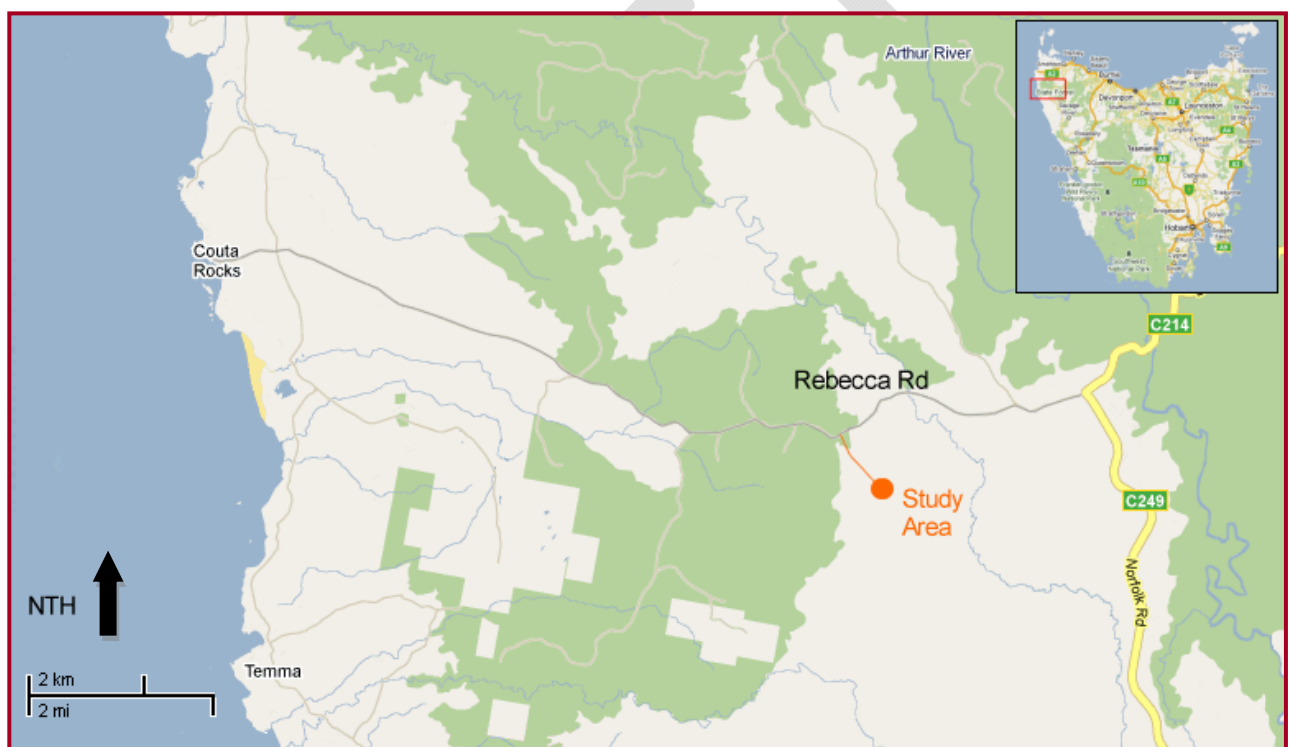


Figure 1. General location of the study area (source: Google maps).

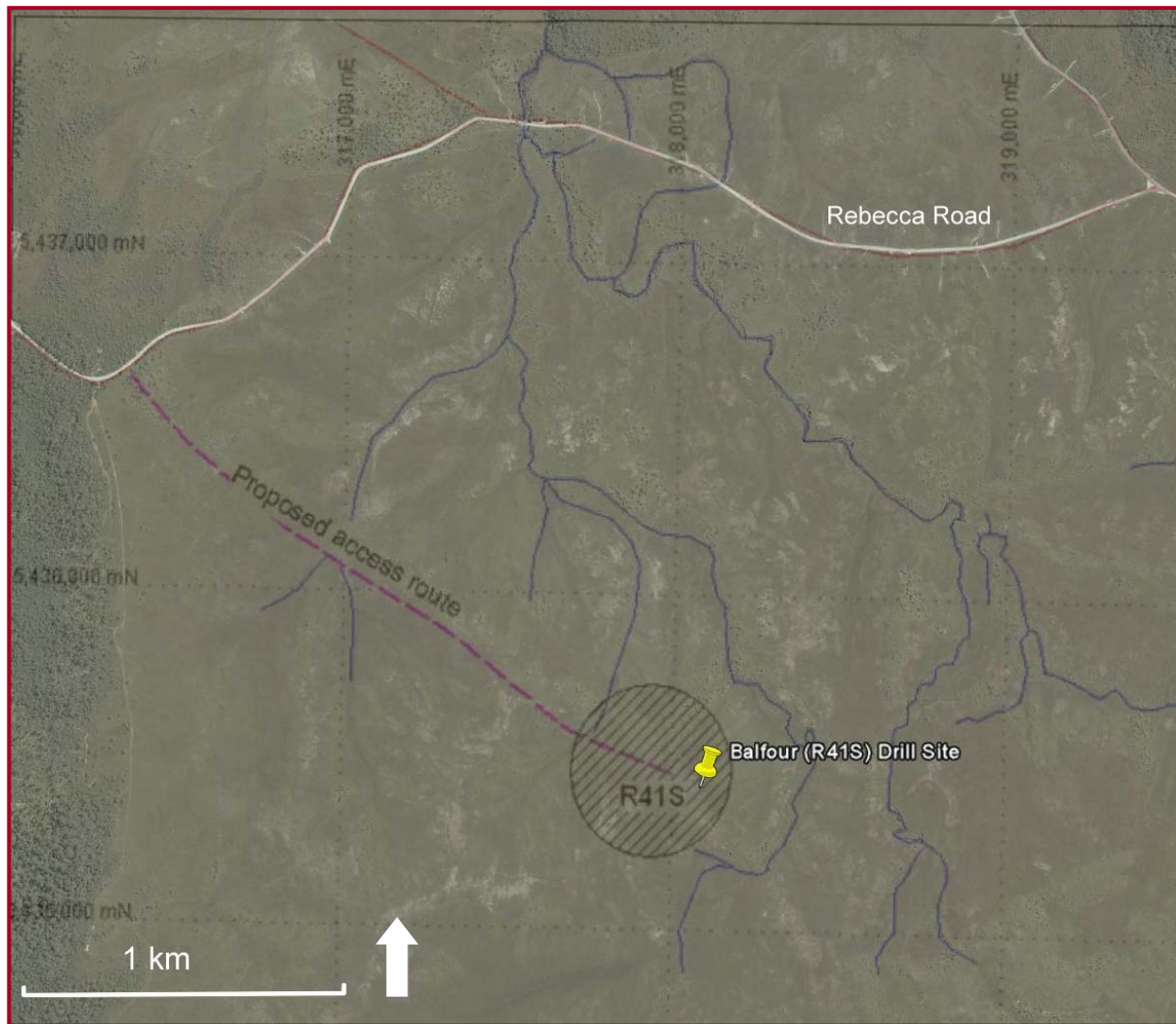


Figure 2. Aerial photograph of the subject land with AMG 66, Zone 55 grid overlay (source: Balfour Joint Venture). Basemap Source: Google Earth Pro 2010

1.4 Statutory controls

1.4.1 Statutory protection

The Aboriginal Relics Act 1975 provides statutory protection for Aboriginal sites, objects and places in Tasmania. The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 and the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 also provide heritage protection at a Federal level. The implications of these statutes are described below.

1.4.2 Aboriginal Relics Act 1975

The provisions of the Aboriginal Relics Act 1975 provide blanket protection for Aboriginal relics. For the purposes of the Act, Sections 3 and 4 define a relic as:

- any artefact, painting, carving, engraving, arrangement of stones, midden, or other object made or created by any of the original inhabitants of Australia or the descendants of such inhabitants;
- any object, site, or place that bears signs of the activities of any such original inhabitants or their descendants; or
- the remains of the body of such an original inhabitant or a descendant of an original inhabitant who died before the year 1876 that are not interred in -
 - i) any land that is or has been held, set aside, reserved, or use for the purposes of a burial ground or cemetery pursuant to any Act, deed, or other instrument; or
 - ii) a marked grave in any other land.
- No object made or created after the year 1876 shall for the purposes of the Act be considered a relic, and no activity taking place after that year shall for those purposes be regarded as capable of giving rise to such a relic.

The following sections are particularly pertinent:

Section 14 states that it is an offence to:

- destroy, damage, deface, conceal, or otherwise interfere with a relic;
- make a copy or replica of a carving or engraving by rubbing, tracing, casting, or other means that involve direct contact with the carving or engraving;
- remove a relic from the place where it is found or abandoned;
- sell or offer or expose for sale, exchange, or otherwise dispose of a relic or any other object that so nearly resembles a relic as to be likely to deceive or be capable of being mistaken for a relic;
- take a relic, or cause or permit a relic to be taken, out of this State; or

- cause an excavation to be made or any other work to be carried out on Crown land for the purpose of searching for a relic.

Section 7 makes provision for the declaration of an area of land in which a relic is situated to be a 'protected site', where the Minister, on the recommendation of the Director of the Aboriginal Relics Advisory Council, is satisfied that preservation of the relic is warranted.

Section 8 outlines provisions for the maintenance of protected sites.

In practice, the provisions of the Act require an Aboriginal Heritage Investigation Report when initial consultation with Aboriginal Heritage Tasmania, prior to development taking place, results in advice to the proponent that such an investigation is required.

<http://www.aboriginalheritage.tas.gov.au/process.html> provides a detailed description of the appropriate steps to be undertaken prior to development.

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

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

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

There are no Aboriginal sites or places within the study area currently subject to a *Declaration*.

1.4.4 Environmental Protection & Biodiversity Conservation Act 1999 (Commonwealth)

The EPBC Act provides protection for natural and cultural heritage places at a Federal level. The Act established three heritage registers: World heritage, Commonwealth heritage and National heritage. World heritage items are those listed for outstanding international heritage values. National heritage items are assessed as having natural or cultural significance at a national level. The World and National lists may include items on private or State crown land. The Commonwealth list only includes items on land owned by the Commonwealth.

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

There are no items within the study area currently listed as items of National or World heritage.

1.5 Project aims and objectives

Specific aims of the study were as follows:

- liaise with Aboriginal Heritage Tasmania to discuss project specific assessment requirements;
- assess the potential composition, extent and significance of Aboriginal sites, objects and potential archaeological deposits within the proposed activity area;
- assess the scientific and public significance of sites, objects and/or PADs and the potential impact of the proposed activity on those significance values;
- engage an Aboriginal Heritage Officer (AHO) to participate in the investigation and consult with relevant local Aboriginal stakeholders and traditional owners to assess the cultural significance of the study area; and

- provide recommendations that ensure management of Aboriginal heritage during development is undertaken in accordance with best-practice standards as set out in AHT guidelines for Aboriginal cultural heritage management and assessment.

The assessment was undertaken in accordance with the:

- AHT project specific requirements;
- procedures for Aboriginal heritage assessments and management outlined in the Aboriginal Heritage Guidelines and Standards Package for Consulting Archaeologists (*Aboriginal Heritage Tasmania, April 2009*);
- Australia ICOMOS 'Burra' Charter for the conservation of culturally significant places and associated guidelines regarding significance assessment, conservation policy and processes.

1.6 Authorship & Acknowledgements

This report was written by Jim Wheeler (Manager AHMS) and Alyssa Gilchrist (Archaeologist). AHMS archaeologist Erica Walther assisted with fieldwork, research and mapping. Adam Marshall of AHT kindly assisted with TASI site search and review of reports held by AHT.

We would like to acknowledge the assistance provided by Adam Marshall of AHT, who assisted with TASI site search and review of reports held by AHT. We would also like to thank Tim Callaghan (Resource & Exploration Geology) and Robert Saltmarsh, who assisted us with the survey. We would also like to thank Leigh Maynard (Aboriginal Heritage Officer), who assisted with the investigation and with Aboriginal community consultation.

1.7 Timing and Staging of the Project

The project was initiated in January 2010. A meeting was held with AHT in Hobart on 14th January 2010. A TASI site search and review of reports held by AHT was undertaken on 14th and 15th of January 2010 with assistance of Adam Marshall of AHT. Site survey was undertaken on 11th March 2010. The draft report was completed on 18th March 2010.

2 BACKGROUND INFORMATION

2.1 Environmental Context

Archaeological assessment reports include information about the environmental context of study areas because of the important role environmental characteristics played in influencing the types of archaeological sites in any given area. Physical environments influenced both the type and availability of natural resources and the types of cultural activities that were carried out in the past. As a result, this also influenced the types of archaeological sites that may be found.

A determination of the former environmental context is essential to develop accurate models of cultural activity, site distribution patterns and the archaeological potential of any given area. The environmental setting of the study area is discussed below.

2.1.1 Landscape Characteristics

The study area is located within the Arthur-Pieman protected area, approximately 12 kilometres inland from Temma on the west coast of Tasmania. The study area is located on an elevated plateau, which is bordered by forested and coastal land to the west and the north-south aligned Norfolk Range to the east¹. The plateau is host to a number of the creeks and rivers that 'flow in deeply incised valleys dissecting the plateau on their journey to the coast'². The study area is located on button grass plain, which is characterised by gently undulating landforms and shallow, often poorly defined, low order drainage lines.

The climate in the region is 'wet temperate maritime', which averages over 1000mm of rainfall per year. The region enjoys mild summers and a wet, windy winter season³. The inland areas on tend to be less hospitable in the winter months, where '[t]emperatures fall and frost incidence increases dramatically with increasing altitude and distance from the sea'⁴.

¹ Tasmania Parks & Wildlife Service 2002: 13.

² Tasmania Parks & Wildlife Service 2002: 13

³ Tasmania Parks & Wildlife Service 2002: 13.

⁴ Tasmania Parks & Wildlife Service 2002: 13.

2.1.2 Soils and Geology

The study area lies within the Balfour Slates and Sandstones Subgroup of the Rocky Cape Group of sediments, which are formed 'from the partial metamorphosis of shallow marine sediments laid down during the Proterozoic Age'⁵. The Balfour Slates and Sandstones consist of 'trough cross-bedded and gutter-cast quartz sandstone interbedded with siliceous and carbonaceous siltstone, fining up to predominantly laminated chloritic siltstone, lesser micaceous sandstone, and rare quartzite'⁶.

1:25,000 geological mapping of the region indicates a number of smaller subgroups present within the region of the study area, which are summarised in Table 1⁷.

TABLE 1 - Geological Types near the Study Area.

Code	Description
Lrbqs	Mid dark-grey, thin bedded siltstone with minor pale grey quartzose laminae.
Lrbl	Siliceous to carbonaceous siltstone.
Lrbq	Quartzose sandstone to siliceous siltstone with carbonaceous shale.
Lrpr	Siltstone.
Tssp	Spongolite (located 2km WNW of drill site).
Tb	Basalt.

⁵ Tasmania Parks & Wildlife Service 2002: 14.

⁶ LIST Tasmania Interactive Mapping, 1:250k Geology Polygons: accessed Feb 2010.

⁷ LIST Tasmania Interactive Mapping, 1:25k Geology Polygons: accessed Feb 2010.

Tasmanian 1:25,000 geological polygons shown on www.thelist.tas.gov.au indicate the study area is located on siltstone lithologies (Figure 3). The geological mapping shows spongolite sources (shaded blue) located nearby to the immediate west of the study area. It should be noted that broad scale geological mapping can contain inaccuracies because it based on extrapolations from test sites and should not be used as a substitute for ground truthing.

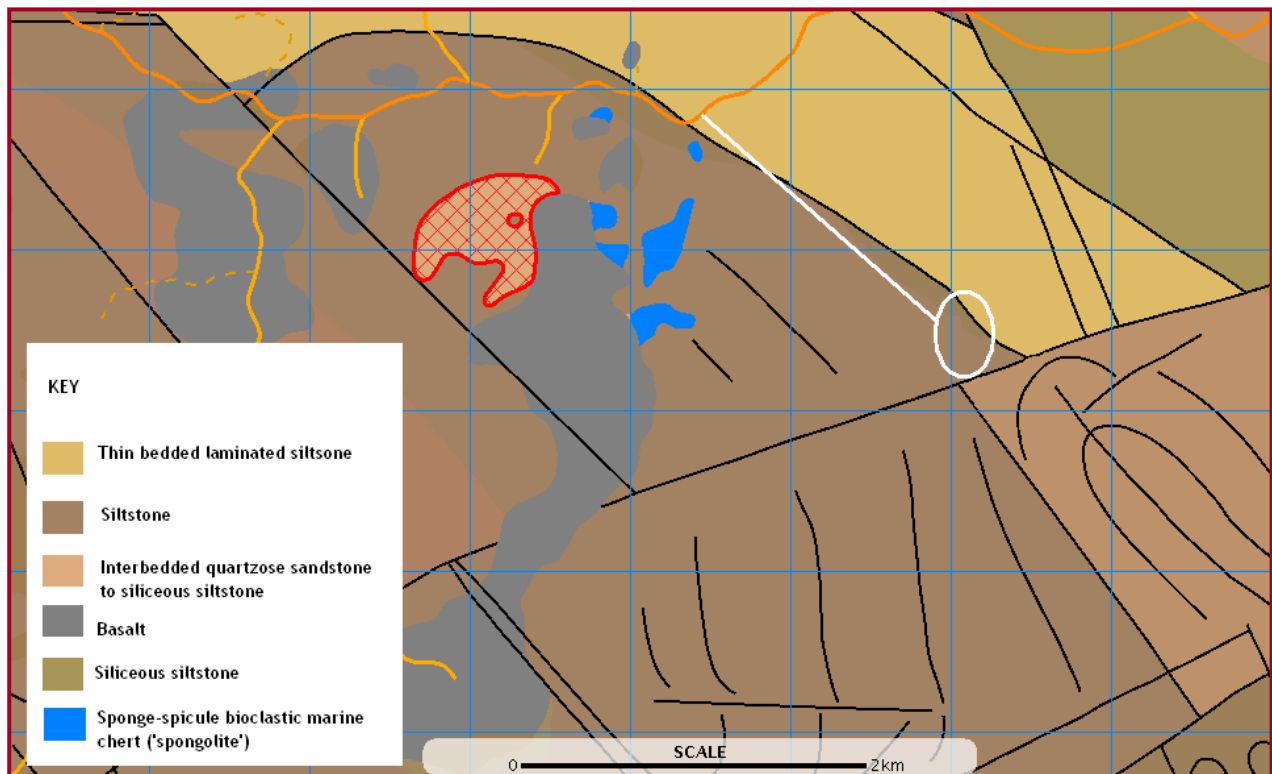


Figure 3. 1:25,000 geological polygons relative to the study area shaded white (source: www.thelist.tas.gov.au)

The area more broadly contains a wide variety of soil types, including 'gravelly skeletal soils derived from Precambrian quartzites, deep sands on marine deposits, well-drained friable soils on Tertiary basalt, and coarse-grained dull mottled profiles which are waterlogged most of the year'. The study area itself is likely to contain *'extensive areas of organic soils and peats, often with sandy surfaces and dense clay subsoils . . . associated with buttongrass moorlands'*.

⁸ Tasmania Parks and Wildlife Service 2002: 15.

⁹ Tasmania Parks and Wildlife Service 2002: 15.

2.1.3 Vegetation

Due to the limited nature of European settlement and land use in the study area, vegetation has been relatively undisturbed over the past 200 years or so¹⁰.

Interactive mapping of vegetation communities present in the region indicates that low, dense vegetation is dominant, in particular that associated with 'buttongrass moorland'. Western wet scrub and lowland sedgy heath are also distributed in patches within the study area, particularly on low elevated crest landforms that sit above the button grass plain (see Figure 4).

Tall wet eucalypt forest and Nothofagus Rainforest are located immediately to the west of the study area (Figure 4)¹¹. These vegetation communities are associated with spongolite sources. Summary data of the vegetation communities present in the vicinity of the study area are presented in Table 2 below.

TABLE 2 - TASVEG 2.0 Types near the Study Area.

TASVEG 2.0 Code	Description	Group
MBU	Buttongrass moorland	Moorland, Sedgeland, Rushland and Peatland.
SWW	Western wet scrub	Scrub, Heath and Coastal Complexes.
SHL	Lowland sedgy heathland	Scrub, Heath and Coastal Complexes.
WNU	Eucalyptus nitida wet forest	Wet Eucalyptus forest and woodland.
DNI	Eucalyptus nitida dry forest and woodland.	Dry Eucalyptus forest and woodland.

¹⁰ Tasmania Parks and Wildlife Service 2002: 15.

¹¹ LIST Tasmania Interactive Mapping, TASVEG 2.0 data layer: accessed February 2010.

2.2 Aboriginal Ethno-history

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encounters¹². Ethnohistorical documents include information recorded by both trained and untrained observers, and are subject to varying degrees of bias¹³.

Due to limited documentation about the lives of the Aboriginal people in the North West region, some of the information provided in the following section refers to general descriptions of Tasmanian Aboriginal life and culture, and does not specifically relate to the particular band/s that occupied the study area at the time of contact.

2.2.1 Social Organisation¹⁴

Tasmanian Aboriginal people each belonged to three distinct social 'groups' - the domestic unit or 'hearth group', the larger social unit or 'band', and a wider, political unit or 'tribe'¹⁵. The hearth group was the smallest of these units, which generally consisted of a family group of between two and eleven people. This group was generally comprised of a husband, wife and children, in addition to (sometimes) other close relatives and friends. The hearth group cooked together around a single fire, 'and on the west coast, occupied a single hut'¹⁶.

Each hearth group belonged to a larger 'band', who identified themselves by a particular name, 'and who were known by that or other names by other people'¹⁷. A male head, whose reputation as a good hunter and formidable fighter earned him his position, led the band. As the land-owning unit with (in the west) a foraging zone of approximately 25-30km of coastline, a band's territory was bound by clearly

¹² It should also be noted that social change in Aboriginal societies is not necessarily limited to that precipitated by contact with European culture. Aboriginal social organisation, beliefs, material culture and way of life is likely to have undergone a significant and unknowable degree of change during the span of human occupation in Tasmania. Thus, the ethnohistorical record, to the degree that it can be assumed to have some accuracy, does not necessarily reflect Aboriginal occupation and use of the region over any significant period of time.

¹³ In the case of ethnohistorical documents relating to Tasmanian Aboriginal people, Ryan (1996: 10) notes that '[i]n particular, their religious beliefs were recorded by people who expected the Tasmanians to conform to notions of nationalistic animism', and may thus be especially unreliable. For discussions of the application of ethnohistorical documents to studies of prehistory, see: Fabian 1995; Feinman 1997; Fredrickson 2000; McBryde 1979, 1984; Wood 1990; Williamson 2004.

¹⁴ Tasmanian Aboriginal social organisation and groupings are described in the ethnohistorical literature using a variety of different terms, and names are spelled a variety of different ways. For consistency, except in the case of direct quotations, terms and spellings employed in this document reflect those used by Ryan (1996).

¹⁵ Ryan 1996: 12-14.

¹⁶ Ryan 1996: 12.

¹⁷ Ryan 1996: 13-14.

marked geographical features. Pre-contact, Aboriginal Tasmania is estimated to have supported at least 50 and up to 85 bands, and a population of up to 4,000 people¹⁸.

Each band belonged to a wider political unit or tribe. Tribes were made up of between five and fifteen bands, all of which spoke the same language or dialect, shared cultural traits, resources, and regularly visited each other's territories and attended gatherings. Nine tribes were present in Tasmania at the time of contact, and are described by Ryan as three distinct 'types' - the eastern and northern tribes, the midland tribes, and the maritime tribes.¹⁹

The study area for this project is located within the boundaries of the North West Tribe, one of Ryan's maritime tribes. The territories of the North West Tribe extended over 'extensive coast but [included] limited hinterland'²⁰, due to the mountainous and comparatively inhospitable western interior. The bands of the North West Tribe 'occupied the north coast from Table Cape to Cape Grim and down the west coast to Macquarie Harbour . . . Inland they restricted their occupation to the coastal regions not more than a few miles' from the waterline²¹. Made up of at least 8 bands, the current study area lies within the territorial boundaries of either the *Manegin* (from the mouth of the Arthur River) or *Tarkinener* (Sandy Cape) band²². Figure 5 shows the tribal boundaries and band locations of the North West Tribe, as defined by Ryan.

¹⁸ Ryan 1996: 13-14.

¹⁹ Ryan 1996: 14-17.

²⁰ Ryan 1996: 17.

²¹ Ryan 1996: 33.

²² Ryan 1996: 38-39.

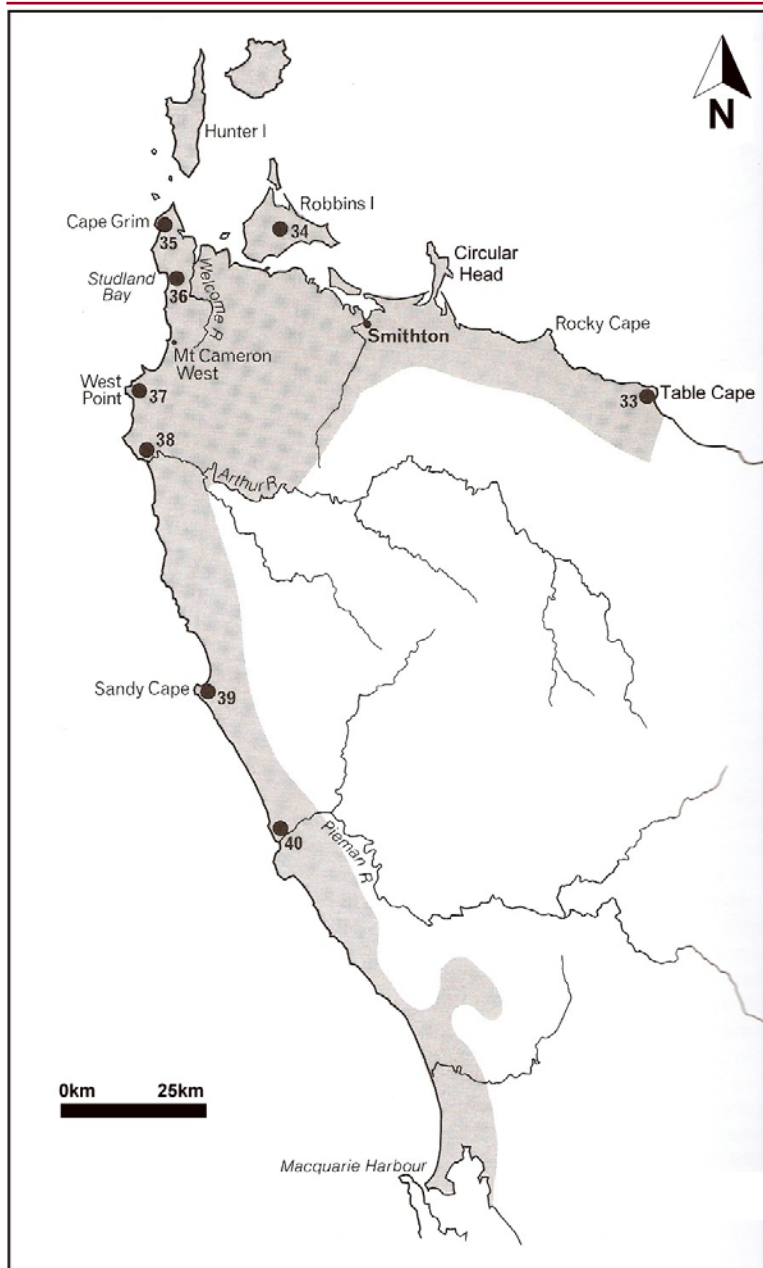


Figure 5. Showing boundaries of the north west tribes (shaded) with band locations marked. Study area falls between 38 (Manegin) and 39 (Tarkinener) bands. Image adapted from Ryan (1996), Map 15.

2.2.2 The North West Tribe

At the time of contact the North West Tribe - which was comprised of at least 8 bands and had a population of between four and six hundred people - was considered to be 'one of the largest tribes in Tasmania'²³. Occupying the North West coast of the island as far south as Macquarie Harbour, the North West people were

²³ Ryan 1996: 33

responsible for a stretch of valuable coastal territory, and played host to other tribes (particularly the North Tribe) in times of seasonal abundance. The people of the North West divided their year into 'public' and 'private' time, and their movements (as well as their associations with other bands and, more broadly, tribes) were heavily influenced by the seasons.

During the summer, large inter-tribal gatherings would take place in the North West, in order to take best advantage of the yearly mutton-birding and elephant seal hunting seasons. At other times of the year, bands from the North West Tribe would enter the territory of others in order to gain access to resources not readily available in their home territory - such as the ochre quarries that lay within the North Tribe's lands²⁴. Entry into another's tribal land was generally undertaken under agreed terms, and with a local band acting as guide in order 'to avoid hostilities', although permission was not always sought²⁵.

The habitations of the North West people were described as being more substantial than elsewhere on the island, and occupied for longer periods of time. This may have been due to the extreme weather conditions, particularly in the winter months. These 'semi-permanent' huts that would be occupied for an entire season, providing, according to the literature 'the only evidence of long term or permanent use' of such structures in Tasmania²⁶.

The people of the North West Tribe were also described by early European observers as being distinctive in their physical appearance - appearing to be taller than members of other tribes, and displaying 'more cicatrices [scars] on the body than those inhabiting other parts of the island'²⁷. As occurred in other parts of Tasmania, the North West people carved art into trees and, again unusually, 'in the North West tribal region only, more permanently into rock'²⁸.

²⁴ Ryan 1996: 38. See also Macfarlane 2008: 8.

²⁵ Ryan 1996: 38

²⁶ Calder 1875: 33; Wunderley 1938: 122

²⁷ Wunderley 1938: 121-122

²⁸ McFarlane 2008: 27

2.2.3 Lifestyle of the Traditional Owners

By studying accounts of early British settlers, we can reconstruct aspects of traditional Aboriginal lifestyle and economy. Although such accounts are fragmentary and present a biased European view of Aboriginal culture, they provide an important insight about Aboriginal use and occupation of the land at Contact.

A defining characteristic of the North West Tribe appeared to be a strong element of seasonality in occupation patterns and lifestyle resulting primarily from the harsh winter months:

After wintering in their beehive villages, the North and North West Tribes would congregate at the mouths of the coastal rivers in early spring to collect the eggs of swans, ducks and other water birds prior to commencing their trek along the coast²⁹

Carrying firesticks, which were used both as hunting aids and to light small fires, the North West people would travel along well-established tracks in their seasonal movements up and down the western coast. Early observers noted that their use of the natural resource was variable, and while the people of the North West used 'roughly constructed rafts made of dead wood'³⁰ to cross rivers, that they would often camp in previously established and sturdily made huts for extended periods of time³¹. Non-food resources were exploited according to their usefulness and functionality, and both plant and animal products were used for medicinal purposes, for example -

the leaves of the stinkwood . . . were worn round the head to relieve pain and . . . muttonbird oil was used in cases of rheumatism³².

Marriage formed a vital bond in Tasmanian Aboriginal society, and adultery was rare. If a spouse passed away, they were 'quickly replaced', and the new husband or wife took over parenting duties for any children who had been born of an earlier marriage³³. Men and women maintained a distinctive physical appearance, where the men:

²⁹ McFarlane 2008: 38.

³⁰ Plomley 1991: 54

³¹ Plomley 1991: 56

³² McFarlane 2008: 27

³³ Plomley 1991: 55

*loaded their scalp hair with a mixture of grease and ochre, twisting the individual ringlets into tubular masses which hung around the head*³⁴

to which they would sometimes add a flower as ornamentation. The women, conversely, had the 'fashion of shaving the head quite closely'³⁵, and hair was cut using abalone shell³⁶. Both men and women exhibited scarring on their bodies, notably across their breasts and shoulders, which was made prominent through the practice of rubbing

*into their wounds powdered charcoal and red ochre mixed with grease, in order to raise high welts on the skin*³⁷.

Death and its associated supernatural power was an important part of the spiritual life of Tasmanian Aboriginal people, who 'carried amulets made from the bones of the dead to warn off harm or illness'³⁸. The Tasmanians 'believed in life after death and that a guardian spirit or 'soul' who lived within their left breast went to live elsewhere - in the case of the Aborigines from the northern part of the island, [to] the islands in Bass Strait'³⁹.

2.2.4 Food Resources

Much of the following information is sourced from H Ling Roth's 1899 *The Aborigines of Tasmania*. Roth was a 'collector, curator and ethnographer'⁴⁰ who sought to create an ethnography of Tasmanian Aboriginal life, by compiling the written accounts of a range of early European observers. Where possible, the information provided here concerns the exploitation of food resources by the North West Tribe. A scarcity of documentation means, however, that some of the source material employed in this section refers to the use of food resources by the wider Aboriginal Tasmanian community.

The people of the North West exploited a wide range of food resources, taking advantage of both terrestrial plant and animal foods and, most notably, marine

³⁴ Ryan 1996: 11

³⁵ Calder 1875: 32

³⁶ Calder 1875: 32

³⁷ Ryan 1996: 12

³⁸ Ryan 1996: 10

³⁹ Ryan 1996: 11

⁴⁰ Gorman 2007 in Davidson & MacDougall (eds): 93.

resources. One of the reasons for the dominance of marine resources (in particular shellfish) in the diet of the North West peoples was:

the western portion of the island is more mountainous, wet and thickly wooded than the rest; kangaroos . . . [were] more difficult to obtain, and the natives live[d] . . . more on shellfish . . . which they obtain[ed] by diving⁴¹

The women of the North West, reputed to be divers of considerable skill⁴², were responsible for catching shellfish such as abalone, which were then cooked simply, with:

[t]he large shells. . . put on the fire, and there, as if on a dish, the animal cooked; it was then eaten without any other seasoning or preparation⁴³.

Lobsters or crayfish were also caught by the women, as noted by Robinson at Arthur River in 1832, where he observed '[w]omen fishing . . . caught crawfish and muttonfish [abalone]'⁴⁴. These creatures were similarly simply cooked, with another early observer noting that:

they took little care of the lobsters, which they threw anywhere into the fire, and when they were ready, they divided the claws among the men and children, reserving the body for themselves, which they sometimes ate before returning to the water⁴⁵.

Other marine resources exploited by the North West Tribe included certain seaweeds such as the sea-wrack, which they '*broiled, and when it was softened to a certain point, they tore it to pieces to eat it*⁴⁶. Seasonal exploitation of sea or water birds such as the muttonbird, swan and duck was also undertaken, with bands travelling to the mouths of rivers along the north and west coast to harvest the eggs of swans and ducks⁴⁷. Along the north-western coast between Sandy Cape and Mt Cameron West, the summer months provided a supply of elephant seal, and

⁴¹ Roth 1899: 87

⁴² Ryan 1996: 11

⁴³ Roth 1899: 90

⁴⁴ Robinson 1832 in Plomley 1993: 652

⁴⁵ Roth 1899: 89

⁴⁶ Roth 1899: 95

⁴⁷ Ryan 1996: 35-37.

at this time of year other tribes would visit the North West in order to take advantage of the season.

A notable absence from the Tasmanian Aboriginal diet at the time of contact was scale fish. Archaeological evidence suggests that the Tasmanians, for reasons unknown, ceased to consume scale fish approximately 4,000 years ago.

Terrestrial animal life also featured in the diet of the North West people, with kangaroo, emu and possum notably popular. Kangaroos were hunted by the men, who would sometimes use fire as a means of flushing the animals out into the open before spearing them⁴⁸. The practice of seasoning the meat with ash before consumption was remarked upon, in that 'occasionally they would dip the savoury flesh in to the alkali ashes of the fire, instead of salt, before putting it into their mouth'⁴⁹.

Women were generally responsible for the capture of possums, which were caught by climbing trees. An early observer describes this practice, noting that:

[t]heir senses of seeing and hearing are particularly acute, and a glance will suffice to tell them when there is an opossum in the tree. They always carried with them a small rope, made of kangaroo sinews⁵⁰.

Using this rope, 'which was passed round their body and the tree'⁵¹ and creating notches in the trunk by means of an unhafted flint tomahawk, the trees were reputedly climbed with great agility and speed. The consumption of these animals was bound by a strict code, whereby some people were only permitted to eat female animals, and some only male⁵².

A wide range of plant foods provided the Tasmanian Aboriginal people with a rich resource, with species such as bracken, coastal saltbush and ferns providing an excellent source of carbohydrates⁵³. A variety of fungi were also consumed, and 'in certain seasons they procured, in great abundance, what is called the native

⁴⁸ Roth 1899: 98

⁴⁹ Roth 1899: 89

⁵⁰ Roth 1899: 98

⁵¹ Roth 1899: 143

⁵² McFarlane 2008: 12

⁵³ Cane, Stockton & Vallance 1979: 79

*bread, a kind of truffle*⁵⁴. Berries and fruits such as that of the kangaroo apple were also widely consumed, as were the seeds of the acacia, which were roasted in their pods⁵⁵.

2.2.5 Movements and Camps

On the west coast there was a year-round abundance of food sources like shellfish and important seasonal sources like fur and elephant seals and muttonbirds, as well as kangaroos and wallabies in the spatially limited hinterland. This is commonly cited as the main reason that the North West Tribe became more settled in their search for food, living in "semi-permanent" villages where they were less affected by seasonal changes, strong winds and heavy rain⁵⁶.

The North West people tended to winter in a single place, and restricted their movements during the colder months. Over the course of a normal year, however, bands would travel along well-used coastal paths as far north as the Hunter islands, south to Macquarie Harbour, and *'into the high inland country belonging to the North people, particularly to the Surrey and Hampshire Hills to collect ochre*⁵⁷. The distances travelled by a band in a year could be quite substantial, *'[t]he Tarkinener, for example, whose local residence was at Sandy Cape, in a normal year could travel 130km north to the Hunter Islands, then 265km south to Port Davey and 95 to 130km inland to the Surrey Hills*⁵⁸.

Beehive shaped huts were erected 'close to foraging areas' to which the North West people would return during their seasonal movements up and down the coast, *'occupying old huts or building new ones as the occasion demanded*⁵⁹. Small wells were maintained in the vicinity of the huts, to ensure a ready source of fresh water, and such wells were also placed at strategic positions along the seasonal tracks, with abalone shells next to them *'as drinking vessels for travellers*⁶⁰.

⁵⁴ Roth 1899: 95

⁵⁵ Roth 1899: 95-7.

⁵⁶ Ryan 1996: 10. See also Plomley 1991: 58

⁵⁷ Ryan 1996: 34, 38. See also McFarlane 2008: 8

⁵⁸ Ryan 1996: 38

⁵⁹ Ryan 1996: 34

⁶⁰ Ryan 1996: 34

2.2.6 Material Culture

Tasmanian Aboriginal material culture included stone, bone, skin, bark and wooden implements, which were put to a variety of different uses. The stone toolkit of the Tasmanian Aboriginal people included flaked and retouched stone, (unhafted) axes, as well as grinding and mortar stones⁶¹. As described by R. Brough Smythe, naturally occurring angular fragments of stone were also used by the Tasmanian people, with minimal alteration. Smythe considered that while some flaking obviously occurred, other stone 'tools':

*are fragments of rocks occurring naturally, and selected because they were of suitable form. These fragments . . . have been treated in one way only; having selected that which appeared to be the best for a cutting edge, the native has improved it by simply striking off small flakes all along the edge, from one side of the edge only. This has been done, however, with so much skill, in all cases, as to keep the line straight. It is not a serrated edge.*⁶²

Wooden implements *included 'spears and waddies, a chisel-like stick, and perhaps a small spatula; and their bone implements were small piercing and spatulate utensils'*⁶³. Baskets and other vessels were made from bark, grasses or seaweed⁶⁴, and plant fibres were twisted and used *'as handles for water containers and as binding for their "relics of the dead"'*⁶⁵. Bark and certain types of grasses were used to produce rope, which served a number of functions, including use as an aid in tree climbing, and to bind canoes⁶⁶.

The men carried fire in the form of lit torches, as well as their other primary hunting tool, the spear⁶⁷. The spears were between 2.4 and 5.4 metres in length, and crafted from the bushy tea tree. The men *'threw their spears in such a way that they spun in flight and were a lethal weapon at sixty to seventy metres'*⁶⁸. The

⁶¹ Ryan 1996: 12

⁶² Roth 1899: 145

⁶³ Ryan 1996: 12

⁶⁴ Roth 1899: 89

⁶⁵ Ryan 1996: 12. See also Roth 1899: 144.

⁶⁶ Ryan 1996: 12.

⁶⁷ Ryan 1996: 11

⁶⁸ Ryan 1996: 12

women carried children, water containers, baskets, *'digging sticks and sometimes stone tools'*⁶⁹. The digging stick was the primary tool for the women, who:

*used a stick sharpened to a chisel-like blade at one end to prise abalones and other molluscs from the rocks, to dig up tubers and roots, to break into the burrows of muttonbirds and penguins, as well as to strip sheets of bark from the trees*⁷⁰.

2.2.7 European Contact and its Effects on the NW Tribe

The North West people had a long period of contact with Europeans, beginning with the sealers in 1804⁷¹.

European sealers brought a competition for resources, and many were accused of abducting Aboriginal women. By the mid 1820s, as the Van Diemens Land (VDL) company led the last wave of pastoral expansion into the North West of the island⁷²:

*the sealers had hunted out most of the elephant seals as well as kangaroos on Robbins Island' - forcing that band south and causing tension within the tribe, [and resulting in] . . . deaths on both sides*⁷³.

The North West tribe was thus affected by way of a loss of resources, a loss of territory, violence between the sealers and the local people, and by the abduction of a number of North West women, such that *'[b]y 1830 there were seventy four Aboriginal women living with sealers in Bass Strait . . . twenty one from the North West*⁷⁴.

McFarlane describes the 'annihilation' of the local inhabitants as:

particularly quick, brutal and deliberate in the North West part of the Colony occupied by the VDL Company . . . within the space of eight years of the Company's arrival in 1826, all of the original

⁶⁹ Ryan 1996L: 12

⁷⁰ Ryan 1996: 12

⁷¹ Ryan 1996: 135

⁷² Ryan 1996: 135-7

⁷³ Ryan 1996: 135

⁷⁴ Ryan 1996: 71

*inhabitants (with the exception of one small family) were either killed or deported to the Bass Strait Islands never to return*⁷⁵.

The North West people found their food supplies depleted further as a result of the VDL Company's occupation of the region, and competition was fierce as the incoming pastoralists began 'monopolising all available flat lands'⁷⁶. Although the official company policy was relatively benign and aimed to foster positive relations with the local people, the manager on the ground appeared to issue *'instructions to employees [that] effectively prevented the establishment of any dialogue or constructive relationship with the Aborigines'*⁷⁷. During his time, at least one massacre of Aboriginal people took place in the North West, at Cape Grim, which was played down by the VDL Company management of the time⁷⁸.

While not underplaying the violent dispossession that occurred as a result of the VDL Company's move into the North West, Maxwell-Stewart points out the likely impact of the penal settlement at Macquarie Harbour on the resources available to the western tribes in the early years of a considerable European presence in the region. By 1823, *'there were nearly five times more Europeans resident . . . on the west coast of Van Diemen's Land than on the east'*⁷⁹. The Macquarie Harbour Penal station was located on the border of the North West and South West tribal boundaries, at an *'important nesting ground for swans and ducks'*⁸⁰. A smaller sub-station, also housing a number of permanent occupants, was located further north - and established specifically to intercept the frequent escapees, who would use established Aboriginal tracks to make their way North⁸¹.

The location of the penal station at the site of an important seasonal resource, along with the movements of bands up and down the occupied western coast along the same tracks used by travelling Europeans and escaping convicts, *'meant that it was inevitable that coastal bands would come into contact with convicts, soldiers*

⁷⁵ McFarlane 1997: 1.

⁷⁶ McFarlane 1997: 2

⁷⁷ McFarlane 1997: 5.

⁷⁸ McFarlane 1997: 7.

⁷⁹ Maxwell-Stewart 2009: 66.3.

⁸⁰ Maxwell-Stewart 2009: 66.3.

⁸¹ Maxwell-Stewart 2009: 66.9-66.11.

*and civil officers*⁸². Indeed, most recorded instances of prisoner escapes note raids on Aboriginal camps for resources⁸³.

An unreliable and often poor supply of food from Hobart meant that the inhabitants of the penal station supplemented this resource with '*scale fish, eels, fresh water crayfish, black swans, wallabies, wombats and echidnas*⁸⁴, essentially competing with the local Aboriginal population for food. This, along with the introduction of kangaroo dogs '*noted to have a dramatic effect on the kangaroo and wallaby population*⁸⁵, a trade in kangaroo skins (which were both used on site to make prisoners' jackets and shipped in large numbers to Hobart), and the commercial and in-settlement harvesting of swan skins⁸⁶, is likely to have caused a scarcity of previously freely available resources in the region⁸⁷. This scarcity, then, coupled with the overfishing by European sealers in the north, pastoral expansion which pushed people out of their traditional territories, and the violence associated with all of these ventures, all contributed to the North West people's final dispossession of their lands. The last stage of this dispossession occurred in the 1830s, when Robinson, as an agent of the Colonial government, deported the remaining North West people to islands in the Bass Strait.

⁸² Maxwell-Stewart 2009: 66.4

⁸³ Maxwell-Stewart 2009: 66.11.

⁸⁴ Maxwell-Stewart 2009: 66.5

⁸⁵ Maxwell-Stewart 2009: 66.7 & McNiven et al 1993

⁸⁶ Maxwell-Stewart 2009: 66.8

⁸⁷ Maxwell-Stewart 2009: 66.7

2.3 Regional Archaeological Context

For the purposes of determining settlement and site location patterns, archaeologists examine regional and local trends in the distribution of known sites in relation to environment and topography. This provides evidence about economic and social systems in the past and also assists archaeologists in predicting likely site types, site locations and the nature of the archaeological resource in any given area.

2.3.1 General Background

Tasmania was connected to the Australian mainland between 37,000 and approximately 29,000 years before present and again between 25,000 and approximately 10,000 years before present. Dating of cave and rockshelter sites in southwestern Tasmania for the Southern Forests Project indicates human occupation dating back to 35,000 years⁸⁸, suggesting first occupation during the earlier period of connection between the two landmasses. Recent investigations of an open site to the north of Hobart have been reported in the media, suggesting possible occupation some time between 28,000 - 40,000 years before present⁸⁹. The results of this work have yet to be completed or published.

The majority of the archaeological excavation work undertaken in North West Tasmania has taken place at coastal sites. Notable amongst these are the Rocky Cape sites excavated by Rhys Jones, which *'provide an almost continuous six-metre sequence of habitation from about 8,000 years BP to the nineteenth century'*⁹⁰. A number of studies (discussed below) have also focused on the Rebecca Creek spongolite quarries, which are located to the west of the study area.

Changes in technology and economy have been interpreted in the Rocky Cape sequence. Notably the lower occupation levels are characterized by unifacially flaked pebbles (predominantly of quartzite) and bone tools (points and spatulas made of wallaby bone). At about 5,500 years ago bone tools disappeared from the deposit which was also "poorer in faunal remains". Fish bone is absent from the

⁸⁸ Allen and Cosgrove 1996; Mulvaney and Kamminga 1999: 186.

⁸⁹ www.abc.net.au/news/stories/2010/03/10/2841317.htm

⁹⁰ Colley and Jones 1987; Mulvaney and Kamminga 1999: 346.

deposit formed in the last 3,500 years and stone artefacts of spongolite/spicular chert first appear in the sequence at about 2,500 years ago⁹¹.

2.3.2 TASI Search Results

A search of the Tasmanian Aboriginal Site Inventory (TASI) was undertaken in order to identify the types and distribution of previously recorded Aboriginal archaeological sites in and around the study area. A large number (n = 249⁹²) were found to be located within 10 kilometres of the proposed Drill site - the vast majority of these located west of the study area.

One of the sites, TASI#2557, may be located near the proposed drill rig transit path close to the entry point off Rebecca Road. Information about this site is very limited, it is an un-named site located on a pear mound with artefacts throughout and probable stratigraphy. A total of 13 Spongolite artefacts were found, including two cores. No retouch was evident.

The vast majority of the previously recorded sites within the search region are either isolated artefacts (n = 121) or artefact scatters (n = 88). The remaining sites are either described as quarries (n = 18) or stone quarries (n= 21). Summary data about the previously recorded Aboriginal archaeological sites most relevant to the study area are presented in Table 3.

TABLE 3 - TASI Site Records in the Region.

TASI Site No.	Type	Location	Raw Materials	Description
4232	Artefact Scatter	Open forest, 200m from creek.	Spongolite	10 artefacts located in a disturbed context near to a fire trail. Mudstone/Basalt soil. Vicinity of Rebecca Creek.

⁹¹ Mulvaney and Kamminga 1999: 348. The absence of fish bone from deposits formed in the last 3,500 years is common on Tasmanian sites (Colley and Jones 1987). This has created much speculation as to the cause of the apparent absence of fish from the Tasmanian diet, but as Dunnett (1994: 12) has noted "identification of the immediate causal agent is probably beyond the limits of the archaeological record".

⁹² This number includes multi-component sites (for example artefact scatter and quarry) that have the same site number, but are included here as separate entries.

4233	Stone Quarry	100m from creek.	Spongolite.	Tablets of Spongolite 'float' in mudstone soils. Many unworked small lumps. 3 Cores.
2585	Quarry	Within forest, little elevation.	Spongolite	Exposure of Spongolite containing many natural fractures in addition to 3 definite cores (approx 90cm in size).
2585	Artefact Scatter	Within forest, associated with quarry.	Spongolite.	19 flaked stone artefacts, with one large core embedded in the ground.
2586	Artefact Scatter	50-60m from a creek.	Spongolite, Quartzite	26 Spongolite and three quartzite (1 core 2 flakes) artefacts. No retouch on any identified artefacts. All Spongolite artefacts bear cortex. Scatter located in a disturbed context near to a fire trail, and approximately 70m from a known Spongolite source.
4228	Isolated Artefact	30m from creek on gentle slope	Spongolite.	Single flake.
4229	Artefact Scatter	On ridge, 100m from creek.	Spongolite	2 Spongolite flakes located in a disturbed context on a fire trail. No retouch or cortex.
4230	Artefact Scatter	One metre from creek edge.	Spongolite	2 flakes of good quality Spongolite.
4242	Stone Quarry	At end of Spur 6 Road	Spongolite	Quarry containing 9 artefacts. No reworking evident.

4245	Artefact Scatter	Gently sloping ridge, less than 200m from creek.	n/a	'possibly a camping area with functional relationships with nearby areas'
2345	Quarry	n/a	n/a	No further information available, possibly same site as 2346.
2346	Quarry	n/a	n/a	'dozer distributed - recorded at the time'
2557	Artefact Scatter	Peat mound.	Spongolite.	Peat mound with artefacts throughout. Probable stratigraphy. 13 Spongolite artefacts including two cores. No retouch evident.
2556	Artefact Scatter	Heathland.	Spongolite.	4 Spongolite flakes, 2 'pink grey' and 2 'honey'. No retouch.
7638	Artefact Scatter	Within 150m of Rebecca Creek, on a fire trail.	Spongolite.	20 artefacts of flaked Spongolite, including cores, 1 worked scraper and 'decortication' flakes. Site located within 1km of a Spongolite quarry, and has suffered damage due to forestry industry.
7639	Artefact Scatter	500m from creek, on a fire trail.	Spongolite.	13 artefacts in 3 concentrations, including large flakes. Located 1km from a Spongolite outcrop.
8521	Isolated Artefact	n/a	Spongolite	Single Spongolite flake.
8522	Quarry	n/a	Spongolite	'five large hummocks' of grey-blue Spongolite over 30m.
8525	Artefact Scatter	Brittons	Spongolite	2 retouched flakes.

		Block		
8526	Quarry	Brittons Block	Spongolite	Large boulders of Spongolite with some flakes present. Quarry runs north-south over 40m. Stone is coloured 'honey' to 'rust'.
8529	Isolated Artefact	Brittons Block	Spongolite	Single honeycomb coloured Spongolite flake.
8530	Isolated Artefact	Brittons Block	Spongolite.	Single flake.
8523	Artefact Scatter	Brittons Bock	Spongolite	Grey-red Spongolite scattered over 10m.
8524	Artefact Scatter	Brittons Block	Spongolite	A 'mound of pink Spongolite flakes'.
8527	Brittons Block	Quarry	Spongolite	Large scatter containing '100s' of artefacts including cores and flakes, some located on within the bed of a small creek (not shown on topographic maps).
8531	Artefact Scatter	n/a	Spongolite.	Honey coloured Spongolite.
8584	Isolated Artefact	Brittons Block	Spongolite.	Single Spongolite artefact.
8585	Isolated Artefact	Brittons Block	Spongolite	Small honey coloured flake.
8586	Artefact Scatter	Brittons Block	Spongolite, Quartz.	2 Spongolite and 1 quartz artefact.
8587	Artefact Scatter	Brittons Block	Spongolite	2 flakes, one purple and one honey coloured.

8588	Isolated Artefact	Brittons Block	Quartzite	Large Chopper.
8589	Artefact Scatter	Brittons Block	Spongolite?	2 flaked stone artefacts.
8590	Artefact Scatter	Brittons Block	Spongolite	Spongolite cobbles/flakes. Some cobbles have been flaked, exhibiting a range of colours - pink/blue/grey/pink and white, purple, and black.
8591	Quarry	Brittons Block	Spongolite	A 30cm 'mound' of grey Spongolite cobbles.
8593	Isolated Artefact	Brittons Block	Spongolite	Single Spongolite flake.
8592	Quarry	Brittons Block	Spongolite	Source of grey Spongolite, comprising 2 cobbles.
3662	Quarry/Artefact Scatter	Banks and bed of creek.	Marine Chert?	Quarry extending over 100m x 30m along both banks of a creek and in the creek bed on the margin of a basalt outcrop. High number of artefacts display retouched edges.
4243	Quarry	Rebecca Creek	n/a	Small source area of 20m x 20m, containing 'numerous flakes and cores'
2866	Quarry	Rebecca Creek - located in creek bank.	n/a	Mudstone soil.
2634	Artefact Scatter	Rebecca Creek.	n/a	Scatter of 3 flaked stone artefacts, including scraper and

				core.
2637	Artefact Scatter	Rebecca Road Fire Trail	Spongolite	Scatter of flaked stone artefacts including concave scraper, complete and broken flakes.
4236	Quarry	Rebecca Creek	Spongolite	Spongolite hillock, which has been extensively worked both above and below the main exposure. Flakes, cores and fragments present. Disturbed by dozer.
2555	Quarry	Rebecca Creek	'Carbanceros Chert' (Spongolite)	Very large Spongolite quarry at the boundary of button grass and forest. Comprised of 'millions of flakes, dug depressions and discard mounds' over more than 10ha. Stone is coloured grey, white and honey. This is considered to be the major quarry site to a number of smaller radial/satellite/subsidiary sites. A site complex comprised of at least 3 clustered sites around a central complex. Evidence of campsites 'where refined lithic reduction occurred'.
2572	Quarry/Artefact Scatter	100m from Rebecca Creek.	Spongolite, Chert.	Large shattered tablets of poor quality Spongolite. Associated artefact scatter includes cores, flakes, chert cobbles and retouched flakes.
2573	Artefact Scatter	Rebecca Creek Fire Trail	n/a	2 flaked stone artefacts, including a retouched flake.

2584	Artefact Scatter	50m from Rebecca Creek	n/a	Scatter of more than 50 flaked stone artefacts, including 30 flakes, 5 cores and two possible tools. Assemblage exhibits much variety in reduction phases.
2570	Artefact Scatter	Rebecca Creek	Spongolite	Scatter of over 100 flaked stone artefacts over an area of 50m x 8m. Stone colouring is honey/purple. High proportion of flakes and no cores visible amongst the assemblage.
2574	Artefact Scatter	70m from creek	n/a	2 flakes located in mound debris.
2575	Artefact Scatter	Rebecca Creek Fire Trail	Spongolite	Scatter of 3 Spongolite flakes and 1 scraper.
4235	Artefact Scatter	Waterlogged swamp scrub.	?	Scatter comprising 2 complete flakes and one flaked piece.
2836	Quarry	No Man's Creek	Spongolite	Worked outcrop, including tabular pieces with nodules exposed, over an area of 15m x 25m.

2.3.3 TASI Site Patterning

Site distribution and the variations in the number of sites identified across the region is variable, and in the search area undertaken for this project, notably skewed towards the west. It is unclear to what degree the absence of previously recorded sites to the north, east and south of the study area is related to a real paucity of evidence or to a lack of detailed archaeological assessments of these areas.

Areas that have been subject to surface survey only, will also tend to display fewer recorded Aboriginal archaeological sites than those that have been subject to a program of subsurface testing. Differences in the way different archaeologists understand and define the boundaries of a given 'site', and in which areas are subject to survey and/or subsurface testing (as well as the type of testing employed) will also create a bias in the way site distribution is mapped across the landscape. With these limitations in mind, the site data obtained from the TASI database can provide some useful information about site types and patterning in the region of the study area (see Figure 6).

Artefact scatter and quarry sites are the most common previously recorded site type within the search area, most of which are recorded as being located in close proximity (within 200m) to a fresh water source, usually a creek. Artefact scatter and quarry sites are also present up to the edge and in the beds of creeks. Although information from the site cards is limited in respect to landform types, ridges and other areas of raised ground, along with areas subject to recent disturbance (such as fire trails) appear to be more likely to display artefact scatters that are identifiable through surface survey alone, often because they are erosional landforms where sub-surface cultural deposits are more readily exposed by erosion.

Spongolite is by far the most common raw material identified in Aboriginal archaeological sites within the search area, and extensive scatters of flaked Spongolite have been recorded at several locations. Spongolite quarry sites are common, particularly in the Arthur Pieman Reserve to the immediate west of the study area. There is one large site (TASI 2555) described as site complex from which smaller 'satellite' quarries radiate outwards. Other raw materials present at previously recorded sites in the search region include quartz, quartzite, marine chert and chert.

Site contents include flakes and flaking debris, with a smaller number of cores, scrapers and other pebble tools such as choppers possibly present within a given assemblage.

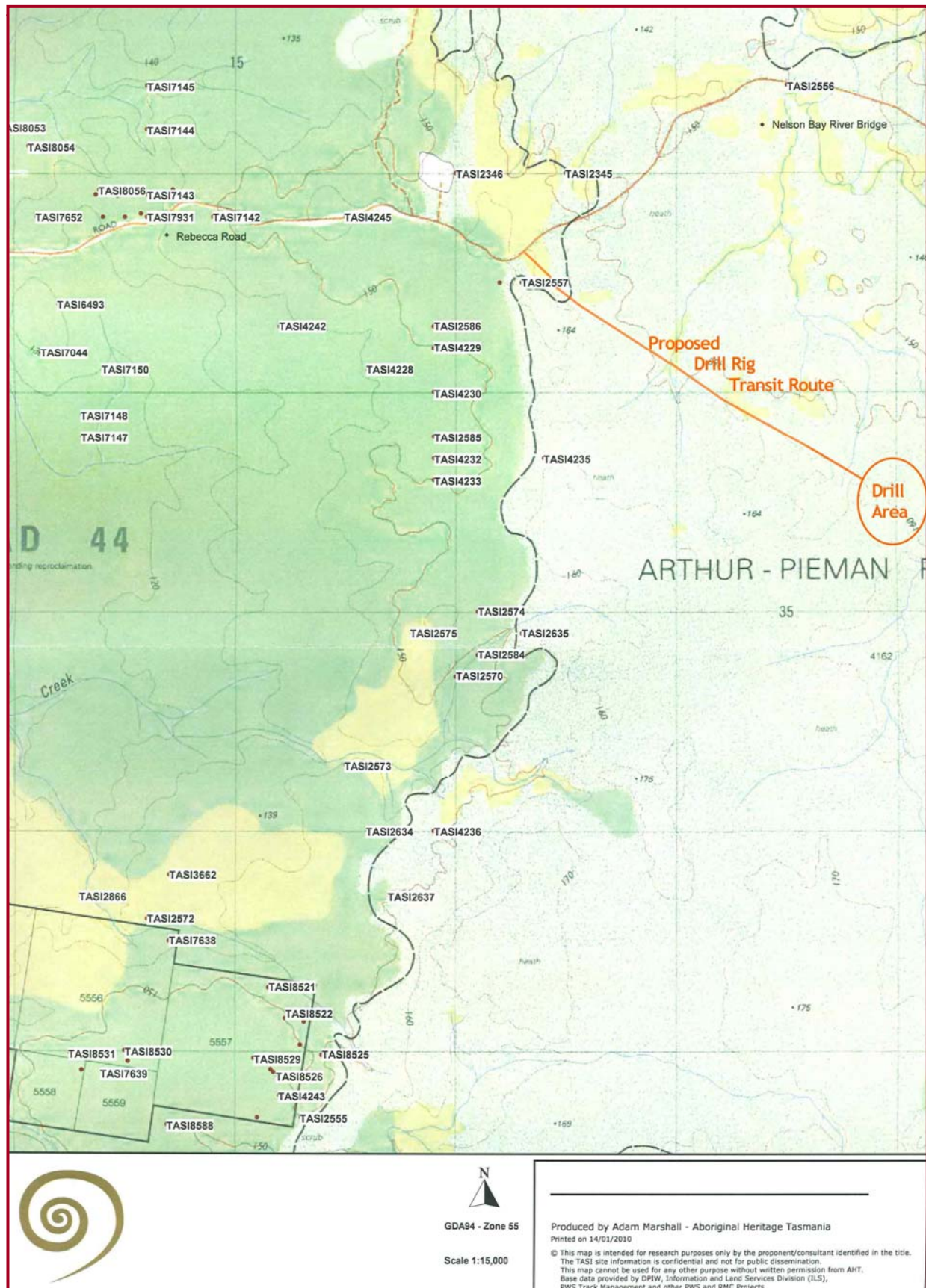


Figure 6. Topographic map showing recorded sites near proposed drill rig transit route and testing area (Map source: Aboriginal Heritage Tasmania).

2.3.4 Previous Studies

A small number of archaeological studies have been undertaken in the north west region of Tasmania in the recent past which have the potential to inform us about the archaeology of the study area for this project. These studies have included survey and excavation undertaken as part of academic research projects, regional studies, and those associated with assessing the landscape for planning and/or conservation purposes. Also of relevance to the Aboriginal archaeology of the study area, given the type of nearby previously recorded sites in the region, are studies involving the dispersal of the raw material spongolite across the Tasmanian landscape, and projects involving the identification and protection of Aboriginal stone quarries.

This section provides a review of archaeological reports and other projects relevant the study area, in order to provide an archaeological context for the current investigations.

Studies of the Rebecca Creek Quarries and Spongolite Distribution.

The spongolite (also known as 'spicular chert'⁹³) quarries in the Rebecca Creek area were first identified in the 1980s. Up until that time the source of the spongolite, which is commonly found in coastal sites in the North West⁹⁴, was unknown.

Spongolite has been described as ranging in colour *"from white through honey, cream, brown, purple, burgundy, pink, grey to black"*⁹⁵. Ranson describes it as *"silicified marine chert composed of the remains of microscopic marine creatures, especially sponge spicules. Spongolite is hard and fractures in a controlled manner, making it a favoured material for use in stone tool making by Aborigines"*⁹⁶.

Mulvaney and Kamminga note that artefacts of spongolite/ spicular chert have a fairly widespread distribution in the North West being found:

along more than 400km of the coast, from Macquarie Harbour on the central west coast to Rocky Cape on the north coast. Such artefacts

⁹³ Mulvaney and Kamminga 1999: 349

⁹⁴ Jones (1966) cited in Cosgrove 1990: 45.

⁹⁵ Cosgrove 1990: 54.

⁹⁶ Ranson 1999

also are found on Hunter Island, and at sites inland to the northern foothills of the Central Plateau⁹⁷.

Apart from the Rebecca Creek sources, outcrops of this stone have been found at Granville Harbour and No Man's Creek⁹⁸. The discussion below focuses on the Rebecca Creek quarry, as this area is of most relevance to the present study.

Cosgrove 1990.

The first surveys of the Rebecca Creek area were undertaken as a result of a Forestry Commission report that an extensive, and then unrecorded, Aboriginal stone quarry had been disturbed during road construction. This was followed by some relatively intensive archaeological investigations of the area in the form of surveys along fire trails which cut through the area and of transects walked off-track, as well as one small excavation carried out in the largest of the three identified quarrying sites.

A total of 24 'campsite' or open artefact scatters/isolated artefacts and four quarry sites (making up a quarry complex) were recorded during this work. The majority (83%) of the recorded open sites contained fewer than 20 artefacts and recorded site areas ranged in size from 4m² to 50m² but Cosgrove acknowledged that these recorded extents were influenced by ground surface visibility. Site densities were noted to be highest along a transect that ran parallel to the forest/button grass plain interface. Cosgrove speculated that the reasons for this distribution may be twofold - that movement through the area was easiest along the edge of the open plain (which also provided shelter in the form of the nearby forest edge) and that sites are clustered in the vicinity of the spongolite quarries.

All of the open site artefacts made from spongolite. Formal tools, though present, were relatively rare and consisted of 7 scrapers making up only 4.4% of recorded artefacts.

The main quarry site TASI 2555 is located on the boundary of the forest and the more open button grass vegetation. It was defined by Cosgrove as measuring 230m (northeast-southwest) by 150m (southeast-northwest) although the dense vegetation

⁹⁷ Mulvaney and Kamminga 1999: 349

⁹⁸ Mulvaney and Kamminga 1999: 349

which covered the area made the definition of the area difficult. It was described as follows:

The site consists of a number of mounds, shallow depressions and major flaking stations. It is not known whether these features are the product of Aboriginal mining or some natural phenomenon (such as tree root depressions). At present we can distinguish, amongst the undergrowth, at least fifteen areas of activity with additional sites scattered beyond the main worked seam of spongolite. These consist of large flakes nodules up to 50cm² in size around which thousands of flakes are scattered⁹⁹.

A 4m x 1m pit was subsequently excavated with the aims of investigating the presence of spatial difference in artefact distribution. A total of 9,827 artefacts were recovered during the excavation, of which over 98% were spongolite with the remainder being chert, quartzite, metasediments or volcanic stone. Cosgrove suggests that the two grey metasediment hammerstones were probably brought into the area from the coast “where this material is common”¹⁰⁰.

No formal tools were recovered from this excavation and Cosgrove suggests that this:

may suggest that the production of these tools occurred away from the quarry, at small temporary campsites or, more likely, at coastal midden sites where a range of activities, such as wood working, were carried out. These artefacts were then possibly carried away and/or traded from the small satellite sites or nearby middens to major centres of occupation such as Rocky Cape and Hunter Island¹⁰¹.

Noting that the results of excavations at Rocky Cape suggest that spongolite first entered the archaeological record there 2,500 years ago, and at the West Point midden at 1,800 years ago, Cosgrove suggests that the quarry dates to that last 2,500 years¹⁰².

⁹⁹ Cosgrove 1990: 54.

¹⁰⁰ Cosgrove 1990: 56

¹⁰¹ Cosgrove 1990: 56

¹⁰² Cosgrove 1990: 112

Richards and Sutherland 1992.

Richards and Sutherland's report on the archaeology of the North West focuses on a 'core area' that can be defined roughly as an area east of the Frankland River, north of Lagoon River and Mt Judith and with a northern boundary running east from Couta Rocks. Two hundred and forty-four Aboriginal archaeological sites had then been recorded within this area - the majority (68%) of these were situated in the coastal zone (within 1km of the coastline high water mark). While the remaining 43% of sites were classed as being within the inland zone, these sites were mainly clustered in and around the Rebecca Creek area and were recorded as a result of earlier systematic surveys of this area and its spongolite sources by Cosgrove (1990) and others¹⁰³.

Richards and Sutherland undertook additional field investigations at the Rebecca Creek spongolite quarries aimed at collecting *"supplementary data necessary to facilitate their nomination to the National Estate Register"*¹⁰⁴. Then recent bushfires resulted in improved visibility in the area at the time of their survey and resulted in the expansion of the known boundaries of some of the previously recorded sites, including large quarries TASI 2555 and TASI 3561. After an inspection of the Rebecca Creek area Richards and Sutherland recommended that the area (divided into two localities 2.5km apart) be nominated for inclusion on the Register of the National Estate¹⁰⁵.

Painter 1992.

Painter examined approximately 1,700 pieces of spongolite held in museum collections in Launceston and Hobart for an honours thesis aimed at investigating the distribution of the material on Aboriginal archaeological sites in northwestern

¹⁰³ Between the survey reported by Cosgrove (1990) and the Richards and Sutherland report (1992) two additional surveys of portions of the North West forest were undertaken. Thomas and Van Eckart (1989) recorded an additional 27 sites in the Rebecca Creek State Forest. Subsequently Macfarlane undertook a regional study of the North West for the Department of Parks, Wildlife and Heritage. The report for this work was not complete at the time of Richards and Sutherlands report, though they were able to access some of the data from it. Macfarlane recorded a total of 71 previously unrecorded sites (Richards and Sutherland 1992: 28). We have not been able to obtain copies of either of these reports.

¹⁰⁴ Richards and Sutherland 1992: 36.

¹⁰⁵ Cosgrove and Thomas and Van Eckart had earlier recognised the significance of the quarry complexes, and Thomas and Van Eckart had specifically recommended listing on the Register of the National Estate. A search of the Australian heritage database did not, however, reveal a current listing for this area.

Tasmania and testing an artefact 'distance decay model' developed by Byrnes¹⁰⁶. She found that artefacts of the material were found up to 200km from its only known source at Rebecca Creek. Spongolite is particularly common in coastal areas in the northwest and there is a significant *"decrease in the amount of spongolite recorded inland"*¹⁰⁷.

Painter divided the coastal distribution of spongolite into three zones:

- Zone 1: 40-50km from the source (between Mt Cameron West and Sandy Cape). Spongolite generally makes up more than half of the raw material in assemblages from this zone.
- Zone 2: 50-150km from the source. The transition from zone 1 to zone 2 is represented by a sharp drop in the proportions of spongolite present in assemblages (usually <50% and >5%).
- Zone 3: described as "the area between Macquarie Harbour and Port Davey, and Table Cape and Northdown" this represents known occurrences of spongolite located the furthest from the source¹⁰⁸.

Painter suggests that these zones may partially reflect known tribal boundaries (the transition from zone 2 to zone 3 marks the boundaries of the North West tribe, and the extent of zone 3 "coincides with the area reported to have been occasionally visited by the North West Tribe") and partially reflect economic rationalism (i.e. "the economic point at which the problems of using lesser quality local material offset the difficulties of transporting exotic material"¹⁰⁹).

Little spongolite is found in inland sites, although it has been found up to 145km inland from its known source. Painter suggests that this may be a reflection of the relatively low-intensity use of the inland area which was characterised primarily by *"seasonal visits to exploit the available resources, or by small groups over short periods during long-distance trips"*¹¹⁰.

¹⁰⁶ This model suggests that there will be a decrease in artefact size and a corresponding increase in the amount of working on artefacts with increase distance from the raw material source – see Painter 1992: 84.

¹⁰⁷ Painter 1992: 86.

¹⁰⁸ Painter 1992: 86.

¹⁰⁹ Painter 1992: 87.

¹¹⁰ Painter 1992: 87.

Painter's analysis of museum collection assemblages revealed that artefact size decreased and the amount of retouch/working increased with increased distance from the known spongolite source - in other words, she found evidence that the 'distance decay model' can be successfully applied to spongolite distribution in the North West.

The following model for spongolite distribution was proposed by Painter:

Spongolite was obtained from the Rebecca Creek quarries in the form of blanks or cores by local Aborigines (i.e. the North West tribe). The campsites associated with the quarry sites comprise part of the Rebecca Creek complex, and were probably occupied by Aboriginal groups for short periods during which spongolite extraction occurred. Some artefact manufacture took place at these camps, possibly in order to provide tools required during the visit, or as preliminary working of blanks to facilitate transportation.

Spongolite was then carried to the coast, where extensive artefact manufacture occurred at large open sites such as West Point. Spongolite artefacts are a major component of stone assemblages along the north west coast, and were transported over this area during seasonal movement, which included the intensive occupation of west coast sites. Secondary working and manufacture occurred at these sites, evidenced by the presence of debitage from most locations used by collectors...These artefacts are thought to have been carried by the consumers, and not traded up and down the coast¹¹¹.

Ranson 1999.

A survey of Britton Brother's Blocks, located immediately to the west of the main quarry site TASI 2555 was undertaken by Ranson in the late 1990s. The survey was aimed gaining a broad understanding of site distribution within this area.

Ranson recorded a number of additional sites and noted that the whole area (including the Rebecca Creek site complex and Britton's Blocks) *"could be considered as an Aboriginal heritage landscape incorporating the extraction of raw material for its manufacture into tools which are used to further modify the local environment"*.

¹¹¹ Painter 1992: 90.

Rebecca Creek was noted to be one of the largest, richest and most complex archaeological areas in Tasmania, and was assessed by Ranson as being of national significance.

2.3.5 Site Distribution in NW Tasmania

Hundreds of Aboriginal archaeological sites, consisting mainly of middens and artefact scatters, have been recorded along the coastline of North West Tasmania. Middens tend to be found where there is access to both shellfish and fresh water. Artefact scatters tend to be located near fresh water, but this is not always the case with isolated artefacts¹¹².

Stanton and Stone have noted that the results of regional surveys in the North West suggest that:

*the density of Aboriginal archaeological sites is highest along the coast and up to 2km inland. Most of these sites are shell middens. Further inland, small scatters of stone artefacts are the more widely distributed site type. The most frequently used raw materials were spongolite, black chert and quartzite. These sites are typically located on gentle slopes adjoining rivers and swamps and ridge crests*¹¹³.

Probably most relevant to the conditions of the present study area is, however, a summary of site distribution in the North West Forests offered by Cosgrove. This can be summarized as follows:

- Open sites are most likely found along the interface between forest and plain, particularly where resources are rich, and are most likely to be found on level or very gently inclined ground.
- Sites will be associated with water sources (within 500m).
- Sites located away from major resources will be sparser, in terms of artefact densities and overall site numbers, than those occurring near resources.

¹¹² Collett *et al* 1998: 82.

¹¹³ Stanton and Stone 2007: 10.

- Occupation deposits, potentially of Pleistocene age, will likely occur in caves or rockshelters that have been formed where dolomite and/or limestone geology occur.
- Sites are less likely to occur in the lowland slopes landsystem than on the lowland plain, but those that do occur there will tend to be located on ridges or on flat bench area on slopes¹¹⁴.

2.4 Predictive Statements

2.4.1 Site Types

Based upon information compiled within the TASI site register, and background archaeological data reviewed above, the types of sites that may occur within or near the study area are as follows:

Open Artefact Scatter.

Open artefact scatters occur almost anywhere that Aborigines travelled in the past. The cultural activity represented by these sites may be associated with hunting or gathering activities, domestic camps, or the manufacture and maintenance of stone tools.

The density of artefacts present in these scatters can vary dramatically and may relate to either transient or short stay camps, or base camps of long term and/or repeated occupation. These types of sites are commonly referred to as '*open campsites*'.

Quarry.

Aboriginal quarries or extraction sites may be found within areas containing accessible sources of spongolite, either in outcrops or exposed by uprooted tree trunks. The spongolite sources are primarily located within the tall forest to the west of the study area and have not been reported on the button grass plains except near the interface between tall forest and the button grass plains. Other

¹¹⁴ Cosgrove 1990: 112

source materials may be found in discrete outcrops across the landscape or in gravel deposits on large river systems or old river terrace deposits.

Isolated Find.

Occur anywhere in the landscape and may represent the random loss, deliberate discard or abandonment of artefacts, or the remains of dispersed artefact scatters.

2.4.2 Aboriginal Site Predictions

Previous studies in northwestern Tasmania indicate areas near the interface between the tall forest and the button grass plain may contain open artefact scatter sites and sub-surface archaeological deposits. Sites may also be found on dry ground within close proximity to permanent water sources. There is also a potential for quarry / extraction sites within the portions of the tall forest that contain sources of spongolite.

Painter's analysis of previous studies and distance-decay study suggests that inland occupation was sparse and characterised by seasonal visits to exploit particular resources or transit between places¹¹⁵. The primary use of hinterland areas appears to have been the extraction of workable stone material. Spongolite was gathered primarily the Rebecca Creek quarries to the west of the current study area and reduced to form transportable blanks and cores. Painter argued the camps associated with this primary reduction activity were probably of short duration and were located near sources.

Cosgrove's investigations indicated a significant number of spongolite artefacts scatters or on the fringe of the button grass plain and tall forest. He speculated that the proliferation of sites on the edge of the button grass plain and tall forest may be due to the relative ease of movement on the plains. However, we note it may also be a reflection of better ground surface exposure and access for survey across the plains compared with the thickly vegetated forest.

Numerous studies in the region indicate that the spongolite blanks and cores were carried to the coast where further reduction and tool manufacture occurred at large open sites and stone artefact / midden complexes.

¹¹⁵ Painter 1992: 87.

Therefore, we would make the following predictions:

- There is some potential for spongolite artefact scatters and sub-surface deposits on the interface between the tall forest and the button grass plain (particularly within 400 metres of the forest edge). Such sites are likely to reflect primary reduction of spongolite source material extracted nearby in the forest;
- There is some potential for small artefact scatters and sub-surface deposits on dry land surfaces in close proximity to permanent water sources on the button grass plain. Such sites are likely to reflect occasional, low intensity, short stay use; and
- Areas on the button grass plain further away from the forest and permanent water have a very low potential for artefact scatters or sub-surface deposits. Any evidence in these areas is likely to be very sparse and consistent with transitory use and discard.

3 SURVEY DESIGN & FIELD METHODS

3.1 Aims

The aims of the archaeological survey were to:

- Examine areas of ground surface visibility to identify surface archaeological sites or objects;
- Identify landforms, vegetation patterns, soils and geomorphic units within the study area to assist in identifying areas of archaeological potential; and
- Gauge the extent and nature of prior land use disturbance and assess the likely implications for survival and preservation of archaeological deposits.

3.2 Survey Strategy & Methods

The investigation area was divided into two survey units based on the principal landforms. The landform survey units were used as basis for presenting and analysing the survey results. The survey units were defined using the system described by Speight in the landform section of the Australian Soil and Land Survey Field handbook¹¹⁶. Each landform element was given a separate survey unit number.

The subject land was traversed on foot, with the aim of locating and examining any areas of ground surface visibility. Areas of erosion and ground exposure were examined for archaeological evidence such as stone artefacts, charcoal and shell. Mature trees were examined for evidence of scarring or carving and rock outcrops were examined for evidence of cultural marking or quarrying.

Ground surfaces were also examined to determine the degree of soil disturbance, erosion and potential for archaeological deposits below current ground.

These observations were combined with predictive modelling to determine the potential for archaeological deposits below current ground.

¹¹⁶ Speight 1990

The survey was comprehensive - it included 100% coverage of the proposed drill rig access route from Rebecca Road and the R41S exploration area. The team walked the route of the proposed drill rig and then walked in transects across the R41S exploration area in approximately 20 metre spacing to identify areas of ground surface visibility.

The survey team comprised two archaeologists and a representative of Balfour Management Pty Ltd. The Aboriginal heritage officer engaged for the project was unable to attend on the day but undertook an additional inspection of the study area the following day.

During the survey, detailed field notes were made and photographs taken to document landscape configuration, soil profiles, soil disturbance, ground visibility and vegetation types.

Any Aboriginal sites or objects found during the survey were to be recorded in detail using a pro-forma developed for field recording and based on the recording standards required by Aboriginal Heritage Tasmania. The location and extent of each site was to be recorded with a 6m accuracy Garmin hand held GPS device.

3.3 Survey Details

The survey was carried out on 11th of March 2010 by archaeologists Jim Wheeler and Erica Walther of AHMS and Robert Saltmarsh representing Balfour Management Pty Ltd. An additional inspection of the study area was carried out by Leigh Maynard (Aboriginal Heritage Officer) on 12th of March 2010.

As discussed in the following section, the survey was affected by thick button grass vegetation covering ground surfaces over the vast majority of the study area. Visibility was limited to old 4WD tracks near the entry point of Rebecca Road and areas of ground exposure on low crest landforms on the plain. Weather conditions were excellent during the survey.

4 SURVEY RESULTS

4.1 Survey Coverage

Effective coverage is calculated by multiplying the % ground exposure (or visibility for detecting artefacts) by the % survey coverage (or actual area surveyed). The calculation shows the effectiveness of the surface survey in detecting archaeological sites and accordingly, how much weight ought to be put on the results.

For the purposes of calculating survey coverage data and discussing archaeological potential, the study area was divided into 2 principal landform units based on topographic landform elements that make up the study area. The units were as follows:

Unit 1 - Moorland Plain (Open Depression).

Unit 2 - Low Crests.

Table 4 shows the survey coverage data and demonstrates that effective coverage was generally poor. Figure 12 shows the extent of low crests within the study area.

TABLE 4 - Survey Coverage Data

Survey Unit	Ground Exposure %	Survey Coverage %	Degree of Soil Disturbance	Estimate of Effective Coverage %
1 - Moorland Plain	< 1 %	100 %	Moderate	1 %
2 - Low Crests	< 5 %	100 %	High	5 %

4.2 General Observations

No Aboriginal sites or objects were identified within the investigation area.

Low ground surface visibility encountered during the survey indicates the investigation was generally ineffective in identifying whether or not surface archaeological sites and/or objects are present. Survey effectiveness was hampered by thick grasses and understorey that limited ground surface visibility. Within survey unit 1 soil exposures were limited to sections of an old 4WD track near the entry point from Rebecca Road. Within survey unit 2, soil exposures were limited to patches of sheet/rill erosion on erosional crest landforms.

Apart from the old 4WD tracks near the entry point from Rebecca Road, the study area shows no evidence of any prior land use disturbance.



Figure 7. Typical visibility encountered during survey (survey unit 1).

4.3 Survey Units

4.3.1 Survey Unit 1 - Moorland Plain

Survey Unit 1 encompassed the button grass plain, which dominates the local landscape. Slope gradients across this area are flat to very gently inclined. The moorland plain is poorly drained with widely spaced shallow and poorly defined ephemeral drainage lines. During the survey we crossed two of these ephemeral drainage lines and both were dry despite a considerable amount of recent rain. The button grass is a thick and fairly uniform suite of vegetation, slightly thicker near ephemeral drainage lines.

No rock outcrops or surface stone materials were seen within this survey unit and the landform was almost completely devoid of trees. The only trees were low shrubs close to the ephemeral drainage lines and some transitional vegetation close to the edge of the tall forest to the west of the study area.

Effective survey coverage was close to zero (less than 1 %) because ground surfaces are covered by thick grasses and shrubs. Ground surface exposure was limited only to exposed soils on old 4WD drive tracks near the entry point from Rebecca Road. These tracks are located on the interface between the button grass plain and the tall forest, which is an area that has potential to contain spongolite primary reduction scatter sites. Although ground exposure was excellent along these tracks, no artefacts or spongolite raw material was observed during the survey.

The lack of ground surface exposure and, more particularly, lack of exposed soil profiles in cuttings, made it difficult to assess the depth and potential integrity of sub-surface soils. However, a small cutting seen on the side of Rebecca Road provided a good indication of the nature of soils on the button grass plain (see Figure 8). This profile revealed a very thin to skeletal A-horizon topsoil (max 10cm thick) with a sharp contrast transition onto B-horizon clay.

With the exception of disturbance associated with the 4WD tracks, soils across survey unit 1 are undisturbed. However, soils are heavily disturbed on the alignment of the 4WD tracks (see Figure 9). The depth of disturbance on these tracks indicates the potential for any intact Aboriginal sites or objects along the line of the 4WD tracks is virtually nil (particularly given the thin nature of soils on the button grass plain).



Figure 8. Typical moorland plain soil profile seen on the side of Rebecca Road.



Figure 9. Disturbance on old 4WD track near Rebecca Road. Despite good GSV, no artefacts or spongolite raw materials were observed.

4.3.2 Survey Unit 2 - Low Crests

Survey Unit 2 comprised low crests that sit above the button grass plain. The crests are broad with gentle to moderate slope gradients.

The crests are dominated by a low sedgy heath that quite is distinct from the button grass vegetation on the moorland plain landform.

During the survey we observed frequent patches of ground surface exposure. Most of the exposures included fragments of weathered quartz and larger blocky pieces of quartz that showed evidence of weathering in the form of splitting and fragmentation. These scatters of quartz were closely examined to determine whether any flaked or worked materials were present. No evidence of either bi-polar or percussion flaking was seen. As a result, we concluded the scatters were entirely natural, although it was noted that they were a potential source of quartz raw materials.

The only trees were shrubs and small trees. It was difficult to assess how old the trees were but none had evidence of scarring or modification.

Effective survey coverage was very low (less than 5 %) because ground surfaces were mostly covered by sedges, grasses and heath. As discussed above, ground surface exposure was limited to small patches of exposed ground on the crests.

The lack of exposed soil profiles in cuttings made it difficult to assess the depth and potential integrity of sub-surface soils on the crests. The impoverished vegetation and lag quartz materials exposed on ground surfaces both strongly suggest soil profiles on the crests are very thin.

Soils across survey unit 2 are undisturbed.



Figure 10. View across low crest landform. The moorland plain can be seen below.



Figure 11. Quartz piece actively weathering (splitting and fracturing).

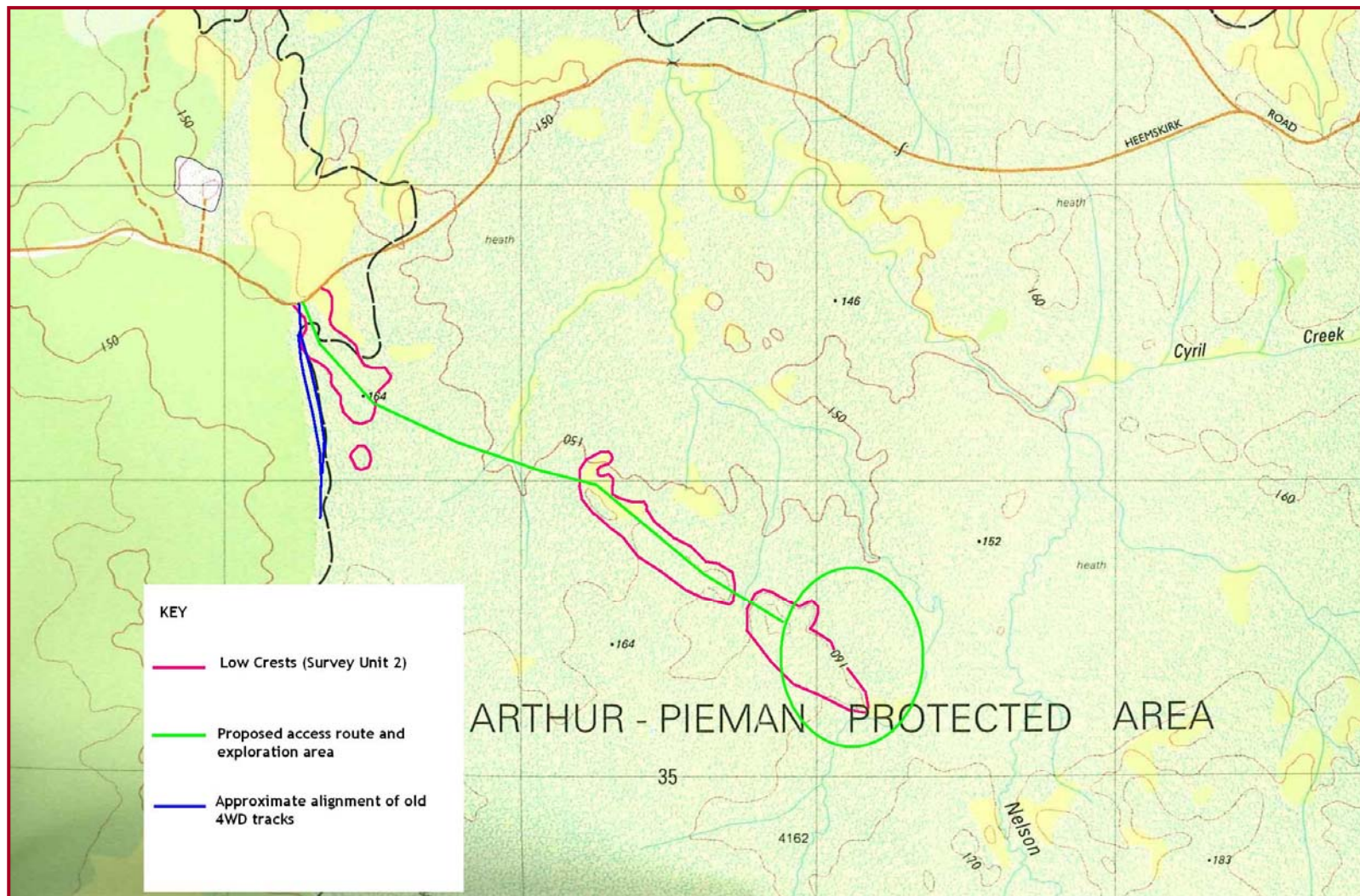


Figure 12. Topographic map of the study area showing proposed access route and exploration area shown by representative of Balfour Management Pty Ltd, low crest landforms (survey unit 2) and approximate line of former 4WD tracks from Rebecca Road.

5 ABORIGINAL COMMUNITY CONSULTATION

5.1.1 Methodology

During our initial meeting, Aboriginal Heritage Tasmania requested that we engage an Aboriginal Heritage Officer (AHO) as part of the assessment process. Therefore we engaged Leigh Maynard, an accredited AHO, to assist us with the investigation and to liaise with relevant Aboriginal community stakeholders to determine whether the activity area has any specific cultural heritage values. Consultation undertaken by Maynard also aimed to determine Aboriginal community views about the proposed activity and Aboriginal heritage management measures.

5.1.2 Outcomes of Consultation

Maynard's report is included in Appendix 1 to this report, which discusses traditional and contemporary uses of the button grass plain, including a discussion of plant resources in the area.

In summary, Maynard recommends old 4WD tracks should be utilised for drill rig access and an Aboriginal Heritage Officer should be invited to monitor the works. Apart from that, no further constraints are identified.

6 INTERPRETATION & DISCUSSION

Drawing on the results of our research and predictive modelling described in Section 2 and the results of survey described in Section 4, we make the following conclusion regarding archaeological sites and potential archaeological sites in the study area:

Old 4WD tracks running off Rebecca Road.

There is little to no potential for intact archaeological sites on the old 4WD tracks running off Rebecca Road because construction and use of the tracks has very heavily disturbed the thin topsoil units and any artefacts within these soils would have been re-worked and probably damaged. Figure 13 shows an aerial photograph of the old 4WD tracks in relation to the tall forest.

Survey Unit 1 (undisturbed areas within 400m of the Tall Forest).

The results of previous investigations in the region and our predictive modelling suggest that there is some potential (probably a moderate potential) that spongolite primary reduction sites may be found within close proximity to the tall forest. Areas within 400 metres of the tall forest that have not been subject to prior disturbance may have archaeological potential.

Survey Unit 1 (areas more than 400m from the Tall Forest).

There is very low potential for archaeological sites across the remainder of survey unit 1. This is because this part of the moorland plain does not contain any reliable permanent sources of water. In addition, previous studies indicate Aboriginal use of the hinterland button grass plains was transitory and sporadic.

Survey Unit 2.

There is a low potential for archaeological sites on the low crest landforms in survey unit 2 for the same reasons described above. The potential on the crest is assessed as slightly higher than the moorland plain because the crests have a more diverse suite of vegetation resources, quartz raw material resources and the lower, thinner vegetation on the crests is more conducive for transit and for camping.

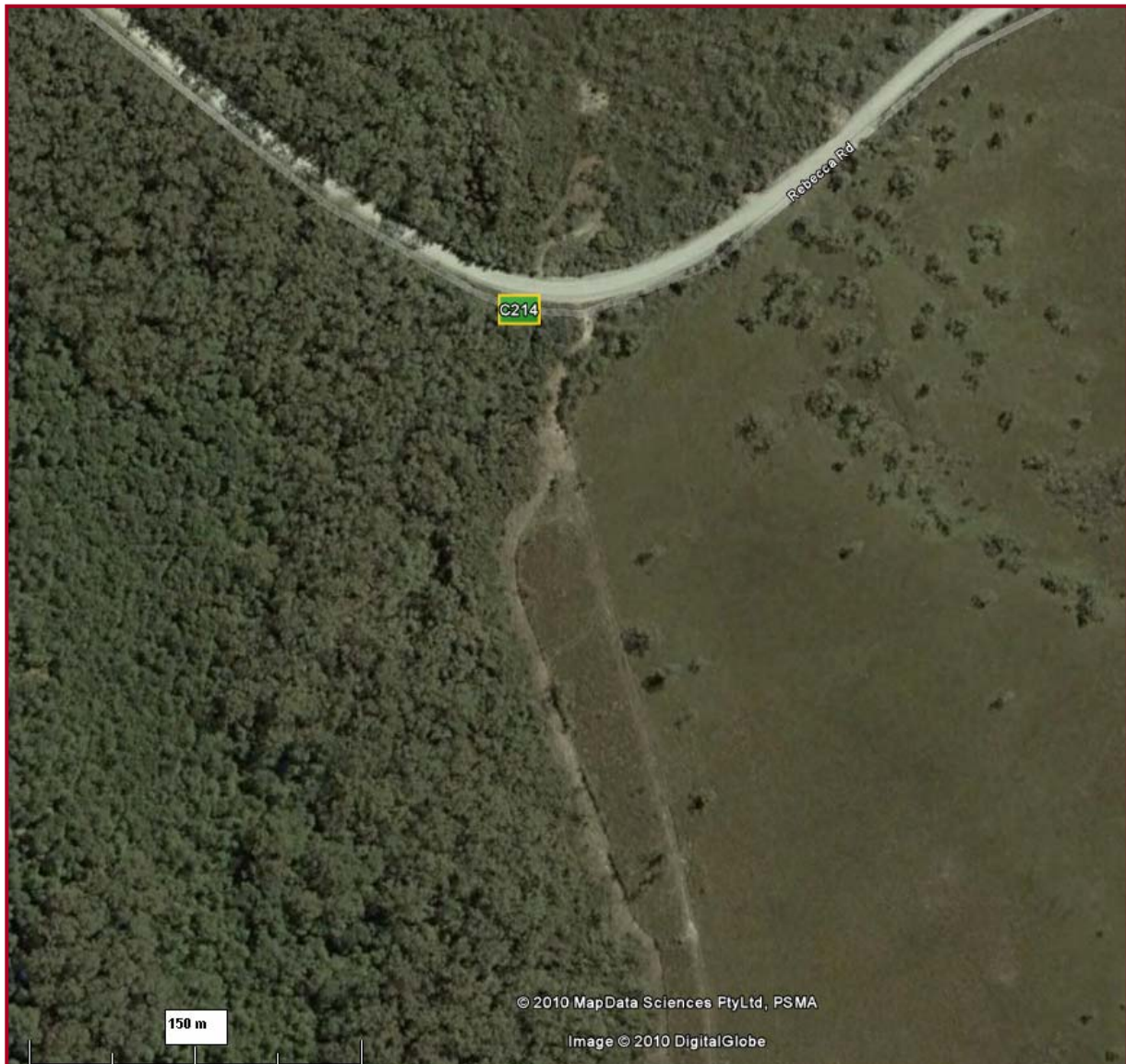


Figure 13. Google Earth Pro 2010 aerial photograph of the 4WD tracks leading off Rebecca Road. The track to the left is on the immediate edge of the tall forest and the track to the right is located on the button grass plain.

7 ASSESSMENT OF CULTURAL RESOURCE

7.1 Basis for significance assessment

Aboriginal sites are assessed in terms of three significance criteria: Archaeological (scientific), Cultural (Aboriginal) and Public Significance. These criteria recognise that Aboriginal sites are valuable in a number of ways. Namely:

- To the Aboriginal community as an aspect of their cultural heritage and as part of continuing traditions;
- To the broader community, for educational, historical and cultural enrichment values; and
- To the scientific community for potential research value.

7.2 Aboriginal Cultural Significance

This area of assessment concerns the relationship and importance of sites to the Aboriginal community. Aspects of cultural significance include both people's traditional and contemporary links with a given site or landscape as well as an overall concern by Aboriginal people for sites and their continued protection.

Unmodified natural features in the landscape can signify sacred sites/places of significance. As such they are archaeologically invisible and can only be identified with the aid of Aboriginal interpretation. If such sites are known they may hold particular cultural significance to contemporary Aboriginal communities.

Furthermore, sites of significance are not restricted to the period prior to contact with Europeans. Often events related to the Contact-period may be so important to local Aboriginal communities that they have become significant. If these events relate to a specific place in the landscape, then that place may become sacred or highly significant to the local Aboriginal communities.

The cultural (Aboriginal) significance is a matter for the local Aboriginal community. No specific cultural values relating to the site have been identified during Aboriginal consultation for the project. Please refer to Appendix 1 for

correspondence received from the AHO regarding the importance of the study area and the views of the Tasmanian Aboriginal Land and Sea Council (TALSC) with respect to the proposed activity and their views regarding management of Aboriginal heritage within the study area.

7.3 Public Significance

This category concerns a site's potential to educate people about the past. It also relates to the heritage value of particular sites as being representative examples of past lifestyles, why they are important, and why they should be preserved.

At present, no Aboriginal sites or objects are known to exist within the proposed activity area. If any intact Aboriginal sites are present, such sites are likely to have public significance as a demonstration of past Aboriginal life on the cusp between the button grass plain and the tall forest with its source of spongolite. The level of public significance would depend on the ability of the sites to communicate aspects of past Aboriginal life to the general public.

7.4 Scientific Significance

The objective of undertaking scientific significance assessment for a site is to determine its research potential in terms of contribution to knowledge about the past. Criteria used to evaluate scientific potential include condition/integrity, representativeness and rarity.

At present, no Aboriginal sites or objects are known to be present within the proposed activity area. If they are present, assessment of scientific significance would be based on the results of further archaeological investigation and would take into account the condition, integrity, representativeness and rarity. An important consideration in assessing the scientific significance would be archaeological research potential.

8 IMPACT ASSESSMENT

8.1 Proposed Activity

The Balfour Joint Venture (BJV) are exploring for Tin-Tungsten deposits within Precambrian sediments on the North West Coast of Tasmania. The BJV is an agreement between King Island Scheelite Ltd. (KIS) and Pleiades Resources Pty Ltd (PRPL) whereby KIS fund an exploration-drilling program focussed on the Specimen Hill Sn mineralisation near Balfour. In addition to the Specimen Hill Program, the BJV plan to test a coincident gravity magnetic anomaly named R41S. It is the R41S prospect that is the subject of this assessment report.

The proposed activity will entail mobilising and walking a Boart Longyear track mounted LF90 diamond drill rig across approximately 2 kms of button grass plain to the R41S exploration area (see Figure 2). A total of six return trips over the plain are envisaged, three to mobilise the rig, drill sloop, fuel and equipment and three to demobilise.

A series of drill holes will be excavated within the exploration area. The aim of the exploration work is to test the potential viability of tin tungsten extraction in the R41S area.

Disturbance will include movement of the drill rig, which will disturb vegetation and surface soil units. Drilling will entail excavation of discrete drill holes across the exploration area.

8.2 Impact Assessment

A comparison of the proposed activity with our assessment of archaeological potential described in section 6 indicates that the majority of the proposed works will be on areas assessed as having very low to low archaeological potential. No further archaeological investigations are warranted in these areas prior to commencement of works because the likelihood of the proposed activity disturbing or destroying any intact archaeological sites is very low. However, it may be prudent to avoid transit across the low crests as far as possible because of the slightly elevated archaeological potential on these landforms. Suggested alternative paths that avoid the low crest landforms are shown on Figure 14.

The north-western section of the proposed drill rig access route (near the entry point from Rebecca Road) will cross within 400 metres of the Tall Forest, which has been assessed as an area of moderate archaeological potential to contain spongolite primary reduction sites. An effective means of mitigating the risk of disturbing one of these sites would be to utilise the disturbed ground on the former 4WD tracks that run off Rebecca Road. Our assessment found that the eastern 4WD track comprises highly disturbed ground with no evidence of artefacts or spongolite raw materials. Our assessment also concluded that the potential for intact Aboriginal archaeological deposits on this section of track was virtually nil. Figure 14 shows a suggested path that utilises the existing eastern 4WD track.

Another issue that should be considered is the possibility that R41S may be a future tin tungsten extraction area. Obviously this sort of activity would have a much bigger impact on the landscape. Therefore, the proposed exploration work will provide a very good opportunity to inspect ground surfaces exposed by the drill rig transit and to examine soil profiles excavated in drill hole columns. Both these sources of information would greatly assist in providing a better level of information about risks associated with a possible future extraction operation. Therefore, it may be prudent to engage a suitably qualified archaeologist and an Aboriginal Heritage Officer to undertake limited monitoring of the drill rig access path and examine soil columns removed from a sample of drill holes on each landform in the exploration area. No more than three days work would be required to obtain the additional information and provide a greater level of confidence for future extraction operations.

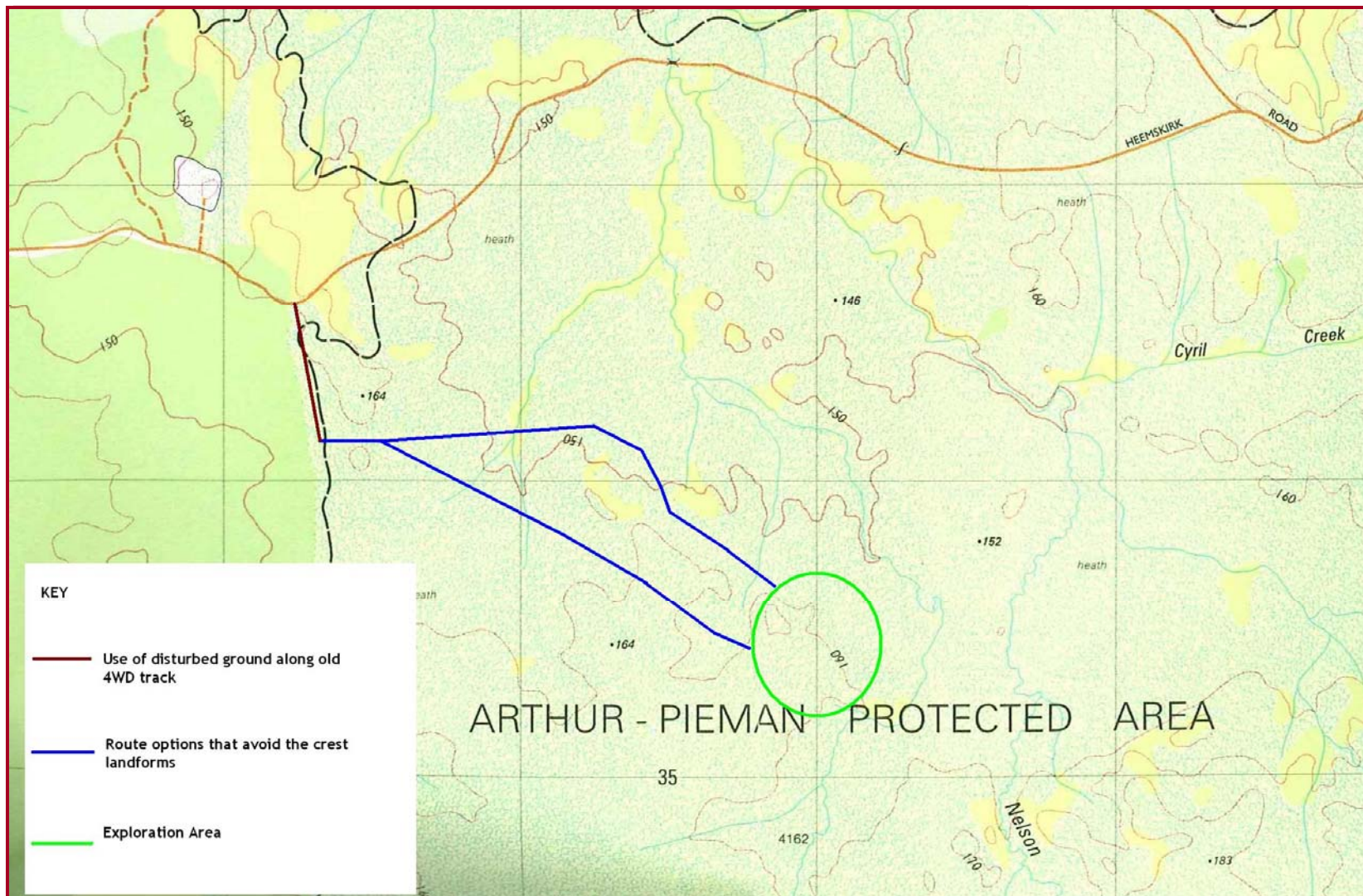


Figure 14. Recommended drill rig transit path options.

9 RECOMMENDATIONS

9.1 Basis for Recommendations

The following recommendations are based upon:

- Legal requirements of the *Aboriginal Relics Act 1975*;
- Aboriginal Heritage Tasmania assessment guidelines and standards;
- Results of the archaeological investigations documented in this report;
- Views and recommendations of Aboriginal community stakeholders; and
- Analysis of the impact of the proposed activity.

9.2 Heritage management

It is recommended that:

1. No further archaeological investigations are warranted in advance of the proposed exploration programme because it is a relatively low impact activity and the archaeological potential within the subject land has been assessed as generally very low to low;
2. Drill rig access into the R41S exploration area should utilise the existing eastern 4WD track off Rebecca Road and, where possible, should avoid crossing low crest landforms. Where possible, the route options shown on Figure 14 should be used;
3. Balfour Management Pty Ltd should consider engaging a suitably qualified archaeologist and an accredited Aboriginal Heritage Officer to inspect the drill rig access path and examine a sample of soil columns excavated at drill sites on the crest and plain landforms. The purpose of this work would be to inspect areas of soil exposed by the drill rig transit and to assess the depth and nature of soil deposits within the exploration area. The aims would be to identify any Aboriginal archaeological deposits exposed by the drill rig transit and to gauge the likely potential for intact sub-surface archaeological

deposits in the R41S area by examining depth, integrity and geomorphic processes evident in the soil profiles. Ultimately the objective of this work would be to provide a higher level of risk assurance for any future tin tungsten extraction operation. The work should require no more than 3 days field time;

4. If any Aboriginal sites or objects are found during the course of the activity, works must cease immediately in that area and a radius of 50 metres should be cordoned off with flagging tape or barrier fencing. Works may continue outside the cordoned area. Aboriginal Heritage Tasmania should be contacted for advice and works should not recommence within a 50 metre radius of the site/object unless written approval has been provided by Aboriginal Heritage Tasmania;
5. If any human burials are found during development works, or at any time during the project, excavation work must cease immediately. Tasmania Police and Aboriginal Heritage Tasmania should be contacted immediately for further advice before any work recommences; and
6. Two copies of this report should be sent to Aboriginal Heritage Tasmania at:

Department of Primary Industries, Parks, Water and Environment
8th Floor, Lands Building, 134 Macquarie Street
PO Box 771, Hobart, Tasmania, 7001

Phone: (03) 6233 6613

or 1300 135 513 (ask for Aboriginal Heritage Tasmania)

Fax: (03) 6233 5555

Email: aboriginal@heritage.tas.gov.au

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APPENDIX 1 -

AHO REPORT

The following was provided by Leigh Maynard (AHO) on 18/03/2010:

Firstly it must be stated that all Aboriginal sites are considered to be significant by today's Tasmanian Aboriginal community and all Aboriginal sites are protected under the *Aboriginal Relics Act 1975*. The Act states that it is illegal to destroy, damage, deface, conceal or otherwise interfere with an Aboriginal relic. There is provision within the Act for these actions mentioned above to occur. The process involves seeking written authorisation from the Minister of the Department of Industry, Environment and Resources for a permit to either destroy, damage, deface, conceal or otherwise interfere with an Aboriginal relics or a combination there of.

However the Aboriginal community would prefer that no Aboriginal heritage site be interfered with, let alone destroyed. As an Aboriginal Heritage Officer (AHO) I am a representative for the Aboriginal community in matters concerning Aboriginal heritage, so it is my responsibility as an AHO to give recommendations that have the least impact upon Aboriginal heritage.

The study area is part of a larger button grass plain that has a very dense coverage of vegetation, the study area also has numerous rocky outcrops with very limited ground visibility. A comprehensive ground survey was conducted along the proposed access road, which included sections of existing track which is very degraded due to vehicle traffic traversing the track in wet conditions in the past. Further to the survey along the existing track the ridgelines, though not substantially high, were also surveyed, as the ridgeline is the preferred location to situate the access road to allow movement of the equipment needed for the drilling at the proposed area where drilling will occur.

The thickness of the vegetation was the main constraint to visibility over the entire study area. This lack of visibility did not allow for a comprehensive ground survey, but did allow for an insight into the main stone type that is located within the study area. This stone is a very course grained marble like rock that is very brittle when struck and does not fracture cleanly, this suggested that the rock was not suitable for making stone tools. Further to unsuitability of the rock type within the study area for stone tool

manufacture there is a major quarry site to the west of the study area that is very large and contains a stone type that was very prized by the local Aboriginal population for making tools. This stone type is spongelite; a rock type that is very fine grained and fractures beautifully and maintains a very sharp edge for an extended period. This stone type was also a very important trade commodity and was traded extensively up and down the west coast and further inland to the Arthur Ranges and the Hampshire Hills. So it is most unlikely that any of the stone within the study area was quarried for stone tool manufacture.

As the buttongrass plains are very wet most of the year any travel by Aboriginal people would have been along the low ridges, so these locations would have been the most likely areas where indicators of Aboriginal heritage would have identified. The ridgelines also had a very sparse coverage of top soil, approximately 5-10cm with an underlying layer of the same rock type present in the outcrops. The lack of soil on the ridgelines allowed a greater visibility than in the gullies and on the plains themselves. However there was the potential for stone artefacts that were once located on the ridgeline to have been washed into the gullies by water run-off, but there would have still been a number of stone artefacts present along the ridgelines.

After a comprehensive ground survey there were no Aboriginal heritage values in regards to stone artefacts or shell middens, but there were numerous natural resources in the fruiting shrubs and the grasses and sedges that are growing within the study area. These resources are still important to the present day Aboriginal community as they are resources that are being utilised and their uses taught to the younger members of the community.

Though there were no Aboriginal sites identified within the study area, there is however the potential for sites to be uncovered in the future due to any new disturbances that may occur.

After consulting the Tasmanian Aboriginal Land and Sea Council (TALSC) it is recommended that the existing tracks though very degraded should be the route along which the proposed new access road traverses. Also that all works be monitored by an Aboriginal Heritage Officer to ensure that no newly identified sites are destroyed by the proposed works that are to be undertaken to allow drilling to occur within the study area.

So if the recommendations are followed then there are no issues preventing the proposed drilling operations within the study area going ahead.

APPENDIX 2 -

GLOSSARY OF TERMS

Aeolian	Wind generated geological processes. In an archaeological context it usually refers to wind-blown deposits and sands.
Backed Artefact / Backing	A retouched tool (maybe a complete, distal, medial or proximal flake) that displays evidence of backing along one lateral margin. This backing may be initiated from the ventral surfaces or alternately may be an example of bidirectional backing initiated from both surfaces (Holdaway and Stern 2004:259).
Bipolar	A method of removing flakes from a core, by striking a core against an anvil (Holdaway and Stern 2004:11). This is often evidenced by crushing at the platform and/or at the termination of the flake; Bipolar flaking is also evidenced as crushing at the base (end opposite the platform) of a core.
Blade	A flake that is twice as long as its width.
Bulbar	Refers to a bulb of percussion produced during a conchoidal fracture
Chert	'a dense, extremely hard, microcrystalline or cryptocrystalline, siliceous sedimentary rock, consisting mainly of interlocking quartz crystals, sub-microscopic and sometimes containing opal (amorphous silica). It is typically white, black or grey, and has an even to flat fracture. Chert occurs mainly as nodular or concretionary aggregations in limestone and dolomite, and less frequently as layered deposits (banded chert). It may be an organic deposit (radiolarian chert), an inorganic precipitate (the primary deposit of colloidal silica), or a siliceous replacement of pre-existing rocks' (Lapidus 1990:102).
Conchoidal	Where a force strikes the surface of a core forming a circular or 'ring' crack that bends back towards the surface of the core,

	forming a partial bulb of percussion. The fracture frequently moves towards the exterior surface of the core, detaching a flake (Holdaway and Stern 2004:34).
Core	Andrefsky (1998:80-81) states a core can be understood as 'an objective piece that has had flakes removed from its surface'; Holdaway and Stern (2004:37; 5-8) provide further clarification 'artefacts that retain the negative flake scars of previous flake removals'.
Cortex	The outer layer of patination of rock is known as cortex. It is found on weathered stone (Holdaway & Stern 2004: 26-27). Cortex types (mostly rough, water worn or pebble) can indicate the source that stone material was obtained from.
Debitage	Small spalls and flakes produced during percussion, bipolar and pressure flaking.
Fine Grained Basalt	Basalt is a volcanic rock. See Volcanic below.
Flake	Depending on the completeness of the flake, a flake may have a number of common characteristics which may include: a platform, bulb of percussion, errillure (or bulbar) scar, point of force impact (PFI or umbo), dorsal ridge and ventral surface, fissures (or indentations), ripple marks (which radiate away from the point of force impact/umbo) and a termination. Not all of these features are typically found on every flake, however they are attributes likely to be present from conchoidal fracture.
Midden	The remains of shellfish gathered and deposited by Aboriginal people. Middens often form complexes that comprise shell, bone, stone artefacts and charcoal. They are commonly found on coasts and estuaries but also less commonly on freshwater streams.
Negative Flake Scar	The negative indentation or scar left behind on a flake, core or

tool when a flake is removed. The presence and abundance of negative flake scars can reveal information about the process of flaking. For example negative flake scars on a) cores can provide information on how intensely the core has been used, b) on the dorsal surface of a flake can indicate how intensely the core was flaked before this flakes was removed and/or that the core platform was cleaned off to start flaking again (platform rejuvenation), c) along the edge of a flake can indicate retouch/backing (Holdaway and Stern 2004:184).

Point	A term applied to certain formal types such as Bondi Points.
Platform	A striking platform or a platform is the surface from which a flake is struck from a Core (Holdaway and Stern 2004:5); flakes retain part of the platform on their proximal end.
Quartz	'crystalline silica, SiO ₂ . It crystallizes in the trigonal system, commonly forming hexagonal prisms. For cryptocrystalline varieties of silica see Chalcedony. Colourless and transparent quartz, is found in good crystals, is known as rock crystal. Varieties that are colours due to the presence of impurities may be used as gemstones, amethyst, purple to blue-violet, rose quartz, pink; citrine, orange- brown; smoky quartz, pale yellow to deep brown' (Lapidus 1990:429).
Quartzite	'a metamorphic rock consisting primarily of quartz grains, formed by the recrystallization of sandstone by thermal or regional metamorphism; a metaquartzite and a sandstone composed of quartz grains cemented by silica; an orthoquartzite' (Lapidus 1990:430).
Retouch	Modification of a flake or core prior to use. Retouch is the 'removal of a series of small, contiguous flakes' from the edges of the artefact (Holdaway and Stern 2004:33). There are several different types of retouch which are identified as backing; stepped; scalar; invasive; notched and serrated retouch.

Reduction	<p>By definition stone material is made smaller when it is struck to produce stone flakes and tools. This process is known as stone reduction.</p> <p><i>‘Modern stone artefact analyses use the reductive nature of stone artefact manufacture as the basis for reconstructing the processes by which artefacts were made. By analysing the size and form of artefacts, archaeologists can obtain information about how stone was acquired from its source, the form in which the stone was transported to campsites, how it was worked, and the way stone artefacts were use until discarded’</i> (Holdaway and Stern 2004:3).</p>
Scarred Tree	<p>A tree that has been marked as a result of bark being removed by Aboriginal people for cultural reasons or for use in making shields, containers, canoes etc. Some trees may also have marks caused by making toe holds for climbing up trees.</p>
Scraper	<p>‘A minimal definition of a scraper is that it is a flake with one or more margins of continuous retouch’. It also indicates the stage of reduction the flake has reached (see Holdaway and Stern 2004:227).</p>
Silcrete	<p>‘a hard surface deposit composed of sand and gravel cemented by opal, chert and quartz, formed by chemical weathering and water evaporation in semi-arid climate. Extensive deposits of silcrete are found in S. Africa and Australia. Silcrete is a siliceous duricrust’ (Lapidus 1990:472).</p>
Spongolite	<p>Sponge-spicule bioclastic marine chert. Patchy deposits are found within the Siltstone lithologies of the Rebecca Creek area</p>
Termination	<p>There are a number of different flake terminations (or ends of a flake) which are possible through flaking stone material. The main types of flake terminations include step, hinge, feather and plunging. Flake terminations can provide information about how the flake was removed.</p>

Tool	A tool is an artefact which shows evidence of modification (i.e. by retouch) or without modification (i.e. show signs of usewear) (Holdaway and Stern 2004:33; 39).
Tuff	'pyroclastic rock composed mainly of volcanic ash (fragments <2mm in diameter). Tuffs may be classified as crystal tuff if they contain a large proportion of crystal fragments, vitric tuff composed mainly of glass and pumice fragments and lithic tuff, containing mainly rock fragments. A consolidated mixture of lapilli and ash is a lapilli tuff' (Lapidus 1990:519-520).
Usewear	'Evidence of distinctive patterns of wear [which is] sometimes found on the edges of artefacts that were believed to have been used for specific purposes' (Holdaway and Stern 2004:41). Several types of usewear can be observed. Holdaway and Stern (2004:41; 167) identify 'chattering' and 'edge damage' as one form of usewear.
Volcanic	'All extrusive rocks and associated high-level intrusive ones. The group is entirely magmatic and dominantly basic. Igneous lithic material generally dark in colour and may be glassy (like obsidian) or very fine-grained or glassy igneous rock produced by volcanic action at or near the Earth's surface, either extruded as lava (e.g. basalt) or expelled explosively' (Lapidus 1990:535).