Appendix G
Aboriginal Heritage Impact Assessment

EXECUTIVE SUMMARY

The Hunter 8 Alliance, on behalf of the Australian Rail Track Corporation (ARTC), is proposing to upgrade approximately 30 kilometres of the Main Northern Railway between Maitland and Minimbah, in the Hunter Valley of New South Wales. The Project would involve the construction of approximately 30 kilometres of new rail track, as well as construction and/or modification of major infrastructure along the Main Northern Railway.

The centreline of the linear investigation area is the existing Main Northern Railway. The investigation area is of varying widths, intended to encapsulate the footprint of disturbance for the third track and other associated works, including construction compounds, haul roads and spoil disposal areas. The investigation area measures 358 hectares in total surface area.

The principal aims of this assessment are to identify and record any Aboriginal heritage evidence or cultural values within the investigation area, assess the potential impacts of the Project on this evidence, assess the significance of this evidence, and formulate recommendations for the conservation and management of this evidence, in consultation with the local Aboriginal community.

The investigation proceeded by recourse to the archaeological and environmental background of the locality, followed by a field survey undertaken with representatives of the local Aboriginal community, in accordance with the relevant Department of Environment, Climate Change and Water (DECCW) policies and Department of Planning (DoP) requirements.

Visual inspection confirmed that negligible potential for heritage evidence exists within the approximately 95 hectares (27%) of the investigation area that has been extensively impacted by earthmoving works, typically associated with construction of the existing railway ("modified investigation area"). The remainder of the investigation area (referred to as the "unmodified investigation area") measures 263 hectares.

A total of 230 hectares, or 87% of the unmodified investigation area, was sampled through the detailed archaeological survey. Due to access constraints, 33 hectares could not be sampled. In addition to this survey coverage, for logistical reasons additional coverage was also obtained of some adjacent areas outside of the investigation area. The archaeological survey resulted in detailed sampling coverage within a total "analysis area" of 317 hectares. Total survey coverage (ground physically inspected for heritage evidence) equated to approximately 102 hectares or 32% of the analysis area. As this coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types was significantly greater than this. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 1.5 hectares or 0.5% of the analysis area.

Notwithstanding the low surface visibility and resulting low proportion of effective survey coverage as a percentage of the entire analysis area, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the investigation area. The coverage was comprehensive for obtrusive site types (for example, scarred trees) but limited for the less obtrusive stone artefacts. Nevertheless, in view of the predictive modelling and results obtained from the sample of effective coverage, it is concluded that the survey provides a valid basis for determining the probable impacts of the Project and formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

In total, 92 Aboriginal heritage sites are known to occur in or within about 50 metres of the investigation area, most of which were identified and recorded during the present survey. These sites comprise 91 open artefact sites and one grinding groove site.

The Project is anticipated to result in impacts to identified and potential heritage resources across approximately 170 hectares of the "unmodified investigation area", including:

- 65 open artefact sites, comprising one site of high significance, eight sites of low to moderate significance and 56 sites of low significance;
- Zones in which there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303);
- In 'modified' areas and in other minor, localised portions of the proposed impact area in which the A unit soil has been totally removed, there is generally negligible potential for any Aboriginal heritage evidence to survive;
- In the remainder of the unmodified impact area, a low to very low density of artefacts and potentially shallow low-density sub-surface deposit of artefacts that may occur widely across this area, consistent with the survey results and occupation model. In general, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the unmodified impact area is low; and
- Other types of heritage evidence are not anticipated to occur within the impact area and other traditional or historical Aboriginal cultural values or associations have not been identified during the course of the assessment.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the Project on Aboriginal heritage will be high within a local context, but relatively low within a regional context.

The significance of the Aboriginal heritage evidence was assessed along criteria widely used in Aboriginal heritage management. It is important to observe that all heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Representatives of the Aboriginal stakeholders expressed their strong interest in the identified evidence and its contemporary cultural value. Two of the identified sites are assessed as being of high scientific significance within a local context, one of moderate to high significance, one of moderate significance, nine of low to moderate significance, and the remaining 83 sites of low significance.

The following management and mitigation measures are proposed, with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the survey and consultation with the local Aboriginal community:

- Provisions relating to Aboriginal heritage should be included in an Aboriginal Heritage Management Plan (AHMP) for the Project. These provisions should be formulated in consultation with the registered Aboriginal stakeholders that responded to the draft report and sought further involvement in the Project and DECCW and specify the policies and actions required to manage the potential impacts of the Project on Aboriginal heritage after Part 3A Approval is granted. The AHMP will comprise detail that, subject to Part 3A Project Approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Aboriginal Heritage Impact Permit (AHIP). The primary elements of the AHMP are outlined below:

  - In order to mitigate the impacts of development and to retrieve and conserve samples of evidence, a program of salvage should be undertaken within the development impact area. This should involve representatives of the registered Aboriginal stakeholders that sought further involvement and qualified archaeologists implementing the following measures:

    - Management strategies for individual sites as outlined in Table 10.1 of the report;

    - Systematically collecting stone artefacts from the identified Aboriginal sites that may be subject to impacts, prior to any development impacts occurring (including from any further open artefact sites that may be identified prior to or during construction);

    - Conducting localised hand excavation at sites Branxton Rail 3, Greta Rail 7 and Greta Rail 8, prior to any development impacts occurring;

    - Conducting mechanical surface scrapes at sites Branxton Rail 15, Greta Rail 9, Greta Rail 13 and Lochinvar Rail 3, accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Conducting broad-area hand excavation at site Rutherford Rail 2, followed by surface scrapes and localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Conducting mechanical surface scrapes within a sample of the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303), accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Curation of any collected heritage evidence in an appropriate manner, as determined in consultation with the registered Aboriginal stakeholders and DECCW during preparation of the AHMP. Application would be required to DECCW under Section 85A of the NP&W Act for the curation of any salvaged items that are removed from any heritage site. Temporary storage of items at locations off-site (for example, during analysis and recording) should be allowed;

    - Analysing the collected evidence and preparing a report detailing the results of the mitigation measures consistent with the DECCW *Aboriginal Heritage Standards and Guidelines Kit*, Project Approval and AHMP. The report should be provided to relevant stakeholders (such as DECCW and the Aboriginal community) within appropriate timeframes;

- Site records should be lodged in a timely manner with DECCW for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and further heritage assessments, and for any evidence that is salvaged under the AHMP;

- Where impacts will be avoided to the identified heritage evidence, appropriate precautionary measures should be implemented for those sites within close proximity of the area of works;

- Consideration should be given to avoiding or minimising impacts to site Rutherford Rail 2 and the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance;

- As a general principle, all relevant contractors and staff engaged on the Project should receive heritage awareness training prior to commencing work on-site;

- Archaeological survey should be conducted to sample all of the potential impact areas that could not be sampled during the present investigation or any subsequent amendments to the impact area outside of the present investigation area;

- Provisions should be included to guide the management of any previously unrecorded Aboriginal heritage sites that may be identified within the Project area, *in lieu* of a Section 90 AHIP;

- Should any skeletal remains be detected during the course of development, work in that location would need to cease immediately and the finds be reported to the appropriate authorities, including the Police, DECCW and Aboriginal stakeholders. Subject to the Police requiring no further involvement, if development impacts cannot be avoided, any Aboriginal skeletal remains identified should be retrieved by hand excavation and reburied outside of the impact zone at a location agreed to by the Aboriginal stakeholders;

- Archaeological investigations should only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholders that sought further involvement, and occur prior to any development impacts occurring to those specific areas or sites. These stakeholders should be afforded the opportunity to be involved in any field studies as per the DECCW *Interim Community Consultation Requirements for Applicants* policy;

- The AHMP should be regularly verified to establish that it is functioning as designed to the standard required;

- Under the terms of the *National Parks and Wildlife Act 1974* it is an offence to knowingly destroy, damage or deface an Aboriginal object without obtaining the prior written permission of DECCW. Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report, in the absence of a valid Section 90 Consent or *in lieu*, Part 3A Approval;

- Single copies of this report should be forwarded to the registered Aboriginal stakeholders; and

- Three copies of this report should be forwarded to DECCW.

After implementation of these management and mitigation measures, it is concluded that the risk of residual impacts to Aboriginal heritage from the Project will be relatively low.

TABLE OF CONTENTS

FIGURES

TABLES

1. INTRODUCTION

This *Maitland to Minimbah Third Track Aboriginal Heritage Impact Assessment* report has been prepared by South East Archaeology Pty Limited for the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC), in relation to the Maitland to Minimbah Third Track Project (referred to herein as 'the Project'). This report has been prepared to assess the potential impacts of the Project on Aboriginal heritage.

1.1 Background

ARTC was created by the Commonwealth and State Governments in 1998 to provide a single body responsible for the National Interstate Rail Network. ARTC is a Commonwealth Government corporation and currently has responsibility for the management of over 10,000 route kilometres of standard gauge interstate rail track in South Australia, Victoria, Western Australia and New South Wales (NSW), as well as the Hunter Valley Rail Network and other regional rail links in NSW.

The Hunter Valley Rail Network extends from the Port of Newcastle to Ulan and Narrabri in the west. It is used by passenger services, freight, wheat and coal services. The majority of trains carry coal from mines located across the Hunter Valley to either Carrington (Port Waratah) or Kooragang Island ports at Newcastle for loading onto ships for export.

Due to the forecast increase in coal throughput at the Port of Newcastle to 190 million tonnes per annum (mtpa) by 2012, a number of rail infrastructure improvements to the Hunter Valley Rail Network have been proposed by ARTC. One of the key improvement projects included in the ARTC ten-year strategic plan is a proposed third track adjacent to the existing Main Northern Railway between Maitland and Whittingham, known as the Maitland to Whittingham Third Track Project.

The Maitland to Whittingham Third Track Project is divided into two stages. Stage 1 consists of the construction of the third track between Minimbah and Whittingham. Project Approval for this project was granted by the Minister of Planning on 26 May 2009 and construction commenced in July 2009.

Stage 2 consists of the construction of the third track between Maitland and Minimbah, known as the Maitland to Minimbah Third Track Project. Stage 2 is the subject of this Aboriginal heritage impact assessment report and is referred to herein as ‘the Project’.

The purpose of the Project is to increase rail reliability and future capacity between the Hunter Valley and the Port of Newcastle. In addition to providing increased track capacity, the Project aims to improve operational performance along the route. These improved efficiencies would be created through:

- Reduced impacts on coal traffic due to track maintenance activities.
- Reduced loss of train paths due to shadow path effects from passenger services.
- Reduced loss of available train paths due to train breakdowns.

The Project would also bring benefits to the local and broader community by generating up to 650 full-time jobs during construction, creating opportunities for local and regional goods and service providers, and providing greater security for existing coal industry jobs.

1.2 Description of the Project

The Hunter 8 Alliance, on behalf of the ARTC, is proposing to construct a third track adjacent to the existing Main Northern Railway between Maitland and Minimbah. The proposed third track would commence in Farley about two kilometres west of Maitland Station at approximate chainage 194.500 kilometres and would run adjacent to the Main Northern Railway for approximately 30 kilometres, concluding at Minimbah at approximate chainage 224.200 kilometres (Figure 1.1).

The proposed third track would be predominantly located on the Up side of the Main Northern Railway, except for a total of about three kilometres of track from approximate chainages 210.170 kilometres to 211.180 kilometres and 214.060 kilometres to 216.000 kilometres, which would be located on the Down side.

The Project would involve the construction of approximately 30 kilometres of new rail track as well as construction and/or modification of major infrastructure along the Main Northern Railway. A summary of the major elements of the Project is provided in Table 1.1.

A Major Project application under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) has been lodged for the Project (Application No. 09_0024) with the Department of Planning (DoP).

South East Archaeology Pty Ltd was engaged in June 2009 by the Hunter 8 Alliance to undertake an Aboriginal Heritage Impact Assessment for this Part 3A application.

1.3 Investigation Area

The investigation area for this Aboriginal heritage impact assessment is a linear corridor which follows the route of the Main Northern Railway between chainages 194.500 kilometres and 224.200 kilometres (refer to Figure 1.1 and detailed plans of the investigation area presented in Appendix 1).

The investigation area captures the footprint of disturbance for the third track and other associated works, including construction compounds, haul roads and spoil disposal areas.

The investigation area measures approximately 358 hectares in area. This includes areas of negligible heritage potential, such as substantial portions of the existing rail reserve.

Table 1.1: Major Project elements.

Project Elements	
Earthworks	Major cut and fill earthworks along the route.
	Other minor earthworks.
Track	Approximately 30 km of new track including turnouts and junctions.
	Relocation of turnouts from Minimbah and Branxton to Belford.
	Upgrade of maintenance siding turnouts at Branxton.
	Track reconditioning of existing Up Main at Greta and Branxton Stations and of the Branxton crossovers.
Drainage	Central and cess track drainage.
	Amendments to 53 culverts for cross drainage.
	Re-alignment of Sawyers Creek.
	Other drainage works around new structures.
Bridges	A new rail underbridge at Stony Creek and Wollombi Road, Farley.
	Closure of the stock crossing at Farley.
	Demolition of the existing rail overbridge at Old North Road, Allandale.
	A new rail underbridge at Allandale Road, Allandale.
	A new rail underbridge for an unnamed tributary of Anvil Creek (chainage 207.776 km).
	Demolition and replacement of the existing rail underbridge at an unnamed tributary of Anvil Creek, Greta (chainage 209.989 km).
	A new rail underbridge at Sawyers Creek, Greta.
	Modification of the existing rail overbridge at Bridge Street, Branxton.
	A new rail underbridge at Black Creek, Belford.
	A new rail underbridge at Jump Up Creek, Belford.
Station Modifications	Modifications to Lochinvar Railway Station.
	Modifications to Greta Railway Station.
	Modifications to Branxton Railway Station.

1.4 Objectives and Purpose of this Report

The objectives of this Aboriginal heritage impact assessment are to:

- Assess the potential impact of construction and operation of the Project on Aboriginal heritage.
- Address the Director General's Requirements (DGRs) for the Environmental Assessment of the Project.

The DGRs identify indigenous heritage as a key issue for the Environmental Assessment. The key issue requirement relating to indigenous heritage is listed below and has been addressed throughout this report:

- Indigenous Heritage, objects, places of significance, natural and landscape values of the corridor and surrounding area, taking into account the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECCW).

The general requirements of the Department of Planning of primary relevance to the key issue of Aboriginal heritage include:

- The significance of the existing environment.
- Planning, land use, development and licensing matters (including strategic and statutory matters).
- The impacts (direct, indirect and cumulative) of the Project for both construction and operation stages, in accordance with the relevant policies and guidelines, and how the Project has been designed to minimise these impacts.
- Description of measures to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor the impacts of the Project and any residual impacts.
- Appropriate and justified level of consultation with relevant stakeholders including (but not limited to) the Department of Environment, Climate Change and Water (DECCW[1]) and the Local Aboriginal Land Councils (LALCs), with description of the consultation process undertaken and identification of issues raised, including where these have been addressed in the Environmental Assessment.

DECCW provided its Environmental Assessment requirements to DoP on 21 May 2009. In relation to Aboriginal cultural heritage values, DECCW identified the following issues to be addressed:

- The Environmental Assessment should address and document the information requirements set out in the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECC 2005) and the *Part 3A EP&A Act Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DoP and DECC 2007)[2].
- The Environmental Assessment should include surveys by suitably qualified archaeological consultants and include evidence of consultation with traditional Aboriginal custodians.
- The nature and extent of impacts on Aboriginal cultural heritage values across the Project area must be identified within the Environmental Assessment, along with a description of any actions proposed to avoid or mitigate impacts or compensate to prevent unavoidable impacts of the Project on Aboriginal cultural heritage values. This should include an assessment of the effectiveness and reliability of any mitigation measures and any residual impacts after these measures are implemented.

[1] DECC recently changed its name to the Department of Environment, Climate Change and Water (DECCW). Originally the Department was known as the National Parks and Wildlife Service (NPWS), and subsequently as the Department of Environment and Conservation (DEC) and from April 2007 as the Department of Environment and Climate Change (DECC).

[2] This is the same document as the 2005 guidelines referred to above and is not publically available from DECC or DoP (Karen Marler, DECC, pers. comm., 28 July 2009).

- The Environmental Assessment must clearly demonstrate that effective community consultation with relevant Aboriginal communities has been undertaken in determining and assessing impacts, developing options and making final recommendations.
- If the Environmental Assessment is relying on past surveys it is critical to confirm that the surveys are consistent with the requirements of the above Part 3A guidelines.
- If any new sites or objects are located, they should be recorded on NPWS site cards and registered on the Aboriginal Heritage Information Management System (AHIMS).

In addition to the above relevant guidelines (effectively the publically available DECC 2005 guidelines), DECCW also noted that the *Interim Community Consultation Requirements for Applicants* (DECC 2004) are relevant.

In order to address the above objects, the primary tasks of the Aboriginal heritage impact assessment are to:

- Undertake register searches, research, Aboriginal community consultation and an archaeological survey to identify and record any Aboriginal heritage evidence or areas of potential evidence or cultural values within the investigation area;
- Assess the potential impacts of the Project upon any identified or potential Aboriginal heritage evidence or cultural values;
- Assess the significance of any Aboriginal heritage evidence identified;
- Provide details of any Aboriginal heritage evidence in accordance with DECCW requirements;
- Consult with the local Aboriginal community as per the DECCW policy entitled *Interim Community Consultation Requirements for Applicants*;
- Present recommendations for the management of any identified Aboriginal heritage evidence, potential heritage resources or cultural values; and
- Prepare a formal archaeological report to meet the requirements of DECCW and DoP, including the draft DECCW *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005) and *Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997).

The heritage investigation has been undertaken by archaeologists with appropriate qualifications and experience in Aboriginal heritage, in accordance with the DoP and DECCW requirements and guidelines.

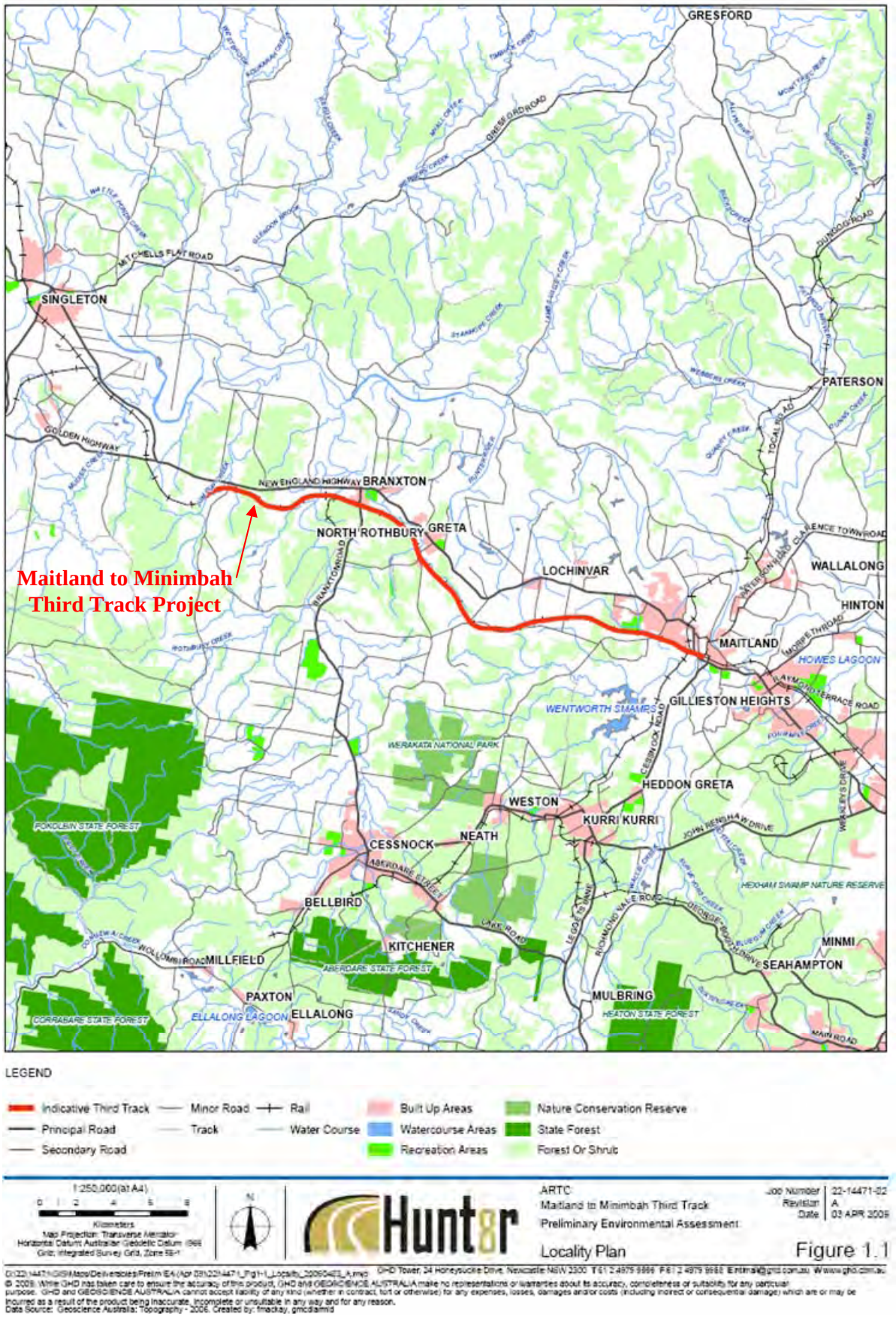


Figure 1.1: General location of Maitland to Minimbah Third Track Project (courtesy Hunter 8 Alliance).

2. EXISTING ENVIRONMENT

2.1 Investigation Area and Locality

The investigation area is marked on Figures 1.1, 2.1 and 2.2 and detailed plans are presented in Appendix 1. The investigation area extends for 30.7 kilometres in length from its eastern end near Maitland at approximate chainage 193.8 kilometres, to its western end at Minimbah at approximate chainage 224.5 kilometres. It measures 358 hectares in total surface area.

The centreline of the linear investigation area is the existing Main Northern Railway. The investigation area is of varying widths, intended to encapsulate the footprint of disturbance for the third track and other associated works, including construction compounds, haul roads and spoil disposal areas. West of Maitland the investigation area extends past Telarah, Rutherford, Lochinvar, Allandale, Greta, Branxton and Belford to its western end where it joins with the Minimbah Bank Third Track Project (Figure 2.1).

In relation to Aboriginal heritage, the investigation area comprises two distinct portions:

- *Modified investigation area* - the portion of the investigation area that has been extensively impacted by earthmoving works, typically associated with construction of the existing railway, such that there is negligible potential for any Aboriginal heritage evidence to survive. The modified investigation area comprises approximately 95.5 hectares or 27% of the investigation area.
- *Unmodified investigation area* - the remaining portion of the investigation area, in which there generally remains some potential for Aboriginal heritage evidence. The unmodified investigation area comprises approximately 262.6 hectares or 73% of the investigation area.

For the purposes of this assessment, archaeological survey coverage has been achieved of a substantial portion of the investigation area, along with additional adjacent areas outside of the investigation area, that were sampled for logistical reasons (refer to Section 5.1). This total sample area is defined as the *analysis area* (refer to Appendix 1). Approximately 72% of the analysis area corresponds to the current investigation area and approximately 28% of the analysis area comprises land immediately adjacent to the investigation area. The analysis area does not include the modified investigation area of negligible heritage potential or approximately 9% of the investigation area that was not subject to archaeological survey, primarily due to property access constraints.

2.2 Topographic Context

The investigation area is located within the Central Lowlands region of the lower Hunter Valley, between the town of Maitland in the east and the locality of Minimbah in the west. It is mostly situated on low, gently undulating hilly terrain close to the broad valley flats of the Hunter River. The Hunter River itself approaches to within a kilometre of the eastern end of the investigation area. The higher order watercourses of Stony Creek, Anvil Creek, Sawyers Creek, Black Creek and Jump-Up Creek, along with various lower order drainage depressions are traversed, including tributaries of these creeks and Wentworth Swamp, Lochinvar Creek, Bishops Creek and Sweetwater Creek.

Seven landform elements were identified within the analysis area (refer to Table 6.1), following McDonald *et al* (1984):

- Drainage depressions, which occupy about 21.9% of the analysis area.
- Flats, which occupy about 7.6% of the analysis area.
- Valley flats, which occupy about 0.3% of the analysis area.
- Simple slopes, which occupy about 64.2% of the analysis area.
- Spur crests, which occupy about 3.6% of the analysis area.
- Ridge crests, which occupy about 1.9% of the analysis area.
- Hillocks, which occupy about 0.5% of the analysis area.

Four classes of slope were delineated across the analysis area (refer to Table 6.1), following McDonald *et al* (1984):

- Level to very gently inclined slopes of less than 1°45´, which occupy about 31% of the analysis area.
- Gently inclined slopes greater than 1°45´ and less than 5°45´, which occupy about 59.4% of the analysis area.
- Moderately inclined slopes greater than 5°45´ and less than 18°, which occupy about 8.9% of the analysis area.
- Steeply inclined slopes greater than 18°, which occupy about 0.7% of the analysis area.

2.3 Geology and Soils

The underlying geology of the investigation area can be characterised as follows (Singleton SI-56-1 and Newcastle SI-56-2 1:250,000 geological maps):

- Quaternary Alluvial deposits are traversed at the eastern end of the route near Maitland.
- Undifferentiated sandstone, siltstone and tillitic conglomerate of the Branxton Formation is traversed around Telarah.
- Sandstone, siltstone, mudstone, shale, conglomerate, tuff, basalt and erratics of the Dalwood Group is traversed around Rutherford and Farley.
- Siltstone, sandstone, basic lava and tuff of the Lochinvar Formation and boulder conglomerate, sandstone, tuff and lava of the Allandale Formation is traversed from west of Rutherford to Lochinvar and Allandale.
- Mudstone, conglomeritic sandstone, sandstone and shale of the Rutherford Formation is traversed from Allandale west towards Greta.
- Mudstone, sandstone, shale and limestone of the Farley Formation is traversed around Greta.
- Mudstone, sandstone and conlgomerate of the Branxton Formation is traversed around Branxton, along with Quaternary Alluvial deposits associated with Black Creek.

- Siltstone and sandstone of the Permian Era Mulbring Siltstone, along with narrow areas of sandstone and conglomerate of the Muree Sandstone are traversed between Branxton and Belford.

- An area of Branxton Formation (mudstone, sandstone and conlgomerate) associated with the Belford Dome is traversed at the western end of the route around Belford.

In the elevated terrain of the investigation area, colluvial gravels are common, including minor silcrete, quartz and tuff. These materials were suitable for artefact manufacture and it may be possible that stone was procured by Aboriginal people from sources within the investigation area. Sandstone and conglomerate bedrock is exposed within minor portions of the investigation area. Sandstone bedrock, typically in watercourses, was utilised by Aboriginal people for shaping and sharpening ground-edge axes.

Soils on the elevated terrain are typically duplex, with a shallow A unit overlying a clay B unit. The shallow depth of the A unit reflects the extent of previous ground disturbance, erosion and natural colluvial slope-wash processes. Soils on the flats, valley flats, basal slopes and many drainage depressions are deeper and include colluvial and/or alluvial deposition.

2.4 Climate, Flora and Fauna

A warm temperate climate with a maritime influence prevails in the lower Hunter Valley. Summers are warm to hot and humid, and winters are cool to mild. In winter, the region has westerly winds and frosts form regularly inland. In summer, winds are onshore from the ocean and augmented by north-easterly or easterly sea breezes. Low pressure troughs bring north-westerlies and then southerlies. Autumn and spring are transitional periods with considerable rain in autumn from low-scale pressure systems in the Tasman Sea (Bridgman and Oliver 1995).

The availability of floral and faunal resources, along with potable water, are primary factors influencing patterns of Aboriginal land use. Vegetation growth and geomorphological processes associated with erosion and sediment deposition also affect the preservation of evidence after its deposition and the ability to detect that archaeological evidence by surface inspection. Vegetation reduces ground surface visibility and therefore reduces the potential to identify archaeological evidence during a field survey. Most artefact occurrences within the Hunter Valley have been identified only when visible on exposures created by sheet erosion or ground disturbance (Dean-Jones and Mitchell 1993).

Mature native vegetation has been removed from much of the investigation area, from as early as the 1820s (refer to photographs in Appendix 3). Much of the investigation area is dominated by introduced pasture grasses and native grasses. Portions of the investigation area consist of remnant Lower Hunter and Seaham Spotted Gum - Ironbark Forest and Hunter Lowland Redgum Forest, albeit primarily regrowth, and these communities would have been more widespread prior to non-indigenous land clearing. *Casuarina* species and other riparian vegetation often occur around watercourses.

The abundance and variety of fauna has been recorded by numerous early settlers and explorers, including many species consumed by the local Aboriginal population. A range of food sources probably available in the locality is listed by Enright (1914), including "wombat, grey kangaroo, wallaroo, red wallaby, common kangaroo rat, flying fox, lizards, goanna, pademelon and bandicoot, with possum, flying squirrel and native cats (quolls) being less common". Fish including "bass, mullet, herring, minnow, bullrout and gudgeons and also ocean species visiting the estuaries, including eel, estuary perch, sea mullet, sand flathead, black bream, jewfish and garfish", were noted (Enright 1914).

Shellfish would have been present in the nearby waters of the broader Hunter River estuary that existed in the mid to late Holocene[3] close to the eastern end of the investigation area, the populations varying in relation to salinity and temperature changes, disease and fluctuations in predator populations (Dean-Jones 1990). Typical estuarine species likely to occur in the nearby former estuarine water body include the Sydney cockle (*Anadara trapezia*), mud whelk (*Pyrazus ebeninus*) and small mud whelk (*Velacumantus australis*), which prefer muddy environments in upper estuaries, mud oyster (*Ostrea angasi*) which prefers sandy habitats in mid-reaches, and possibly edible mussel (*Mytilus planulatus*) and hairy mussel (*Trichomya hirsutus*), which occur nearer the estuary mouth (Sullivan 1982). Rock oysters (*Crassostrea commercialis*) would also attach to rocky shorelines and mangrove roots.

From the sources discussed above, it is evident that a range of plants and animals would have been available for exploitation by Aboriginal occupants of the locality, many on a seasonal basis. The main resource zone of the investigation area would have been the dry sclerophyll forest, with the estuarine/riverine zone of the Hunter River typically several kilometres distant. In addition, riparian vegetation may have been available from the higher order watercourses (for example, Stony Creek, Anvil Creek, Sawyers Creek, Black Creek and Jump-Up Creek) and swamp vegetation from Wentworth Swamps, close to the eastern end of the investigation area, during the late Holocene period.

2.5 Geomorphological History

Reconstructing the landscape prior to non-indigenous settlement is relevant to understanding the nature of Aboriginal occupation in the locality and the post-depositional processes that may have affected any evidence of occupation.

The Hunter Valley is a mature riverine estuary. Formation of the estuary is closely related to glacio-eustatic fluctuations in sea level that have occurred many times over the past million years. These cycles have frequencies of 100,000 years and amplitudes of 100-120 metres. The last cycle began 125,000 years ago with the Last Interglacial phase of high sea levels and warm temperatures.

During the Last Interglacial conditions were similar to present with an extensive deltaic floodplain in the lower valley. Raised estuarine shell beds described by David and Etheridge (1890) belong to this phase of sedimentation, indicating the sea level was about five metres higher than present. The associated terrace deposits are remnants of the Last Interglacial floodplain that covered the estuary and was up to ten metres higher than the present floodplain in the Maitland area (Roy *et al* 1995:70-71). Remnants of these Pleistocene terraces have been identified by Roy (*et al* 1995) in the vicinity of the eastern end of the present investigation area, fringing the Wentworth Swamps.

[3] The Holocene is a geological period that began about 12,000 years ago.

Slow cooling of temperatures and falling sea levels followed, culminating in the last glacial maximum about 24,000 to 17,000 years ago. By the end of the sea regression, the coastline was displaced 25 kilometres to the east (present continental shelf) (Roy *et al* 1995:70-71). The climate was cooler and drier than at present.

Deglaciation and melting of ice sheets occurred rapidly from 18,000 years ago and the Hunter River slowly incised its valley. Much of the Pleistocene[4] floodplain deposited around 125,000 years ago was removed by sub-aerial weathering and lateral migration of the river channels. Post-glacial sea levels rose quickly (about one metre per 100 years) up to 8,000 years Before Present (BP), slowed to half that rate between 8,000 and 6,500 years BP and then stabilised according to Roy and Boyd (1996:11). However, recent evidence suggests that the sea rose above its present level by around 7,000 years BP and remained above that level until the late Holocene.

As the sea level rose from 18,000 years BP to the mid-Holocene, the Hunter River retreated as a bay head delta up the valley to Bolwarra, near Maitland, leaving the valley (including close to the present investigation area) infilled with marine to brackish water in an estuary stretching 32 kilometres inland from the present coastline (Roy and Boyd 1996:74).

Once the sea level stabilised, a new cycle of estuarine and deltaic sedimentation commenced in the lower Hunter valley (Roy *et al* 1995:70-71). Estuarine environments were most widespread in the mid-Holocene (around 7,000 - 4,000 years BP) when the valleys were first drowned, but have since decreased in size as they infilled with sediment and the deltaic flood plain prograded seaward from Bolwarra, infilling the valley (Roy *et al* 1995:74). The shoreline changes were accompanied by dramatic and rapid environmental transformations as the shallow, saline estuary was converted to swamps and terrestrial floodplains. Most of the larger coastal rivers in south-eastern Australia experienced these changes during the late Holocene (last 2,000 - 4,000 years) (Roy and Boyd 1996:31). More recently, substantial changes to the hydrology of the region in historical times by levees and channel diversions has further transformed the freshwater swamps to grassy, drier meadows.

Hence, the environmental history of the locality of the investigation area can be tentatively reconstructed as follows:

- During the last glacial maximum from about 24,000 to 17,000 years BP, the coastline was located approximately 25 kilometres to the east of its current location, as the sea level was about 130 metres below the present level. The climate was cooler (possibly 6-10º Celcius) and drier than at present. The investigation area would have bordered the Hunter River valley, and although the river itself would have been located in generally its current location due to topographical constraints, it would have been lower in elevation than at present (that is, the valley was deeper). Potable water was probably not frequently available within the vicinity of the investigation area, apart from in higher order watercourses such as Black Creek. In terms of subsistence resources and potable water, most of the investigation area did not represent an environment conducive to focused Aboriginal occupation, but may have been utilised in a low intensity;

- Deglaciation and melting of the ice sheets occurred rapidly from 18,000 years BP as temperatures rose. Post-glacial sea levels rose quickly (about one metre per 100 years) up to 8,000 years BP, before slowing to half that rate between 8,000 and 6,500 years BP. Mean eustatic sea levels remained between 1.5 and 2.2 metres above the present level until around 3,600 years BP;

[4] The Pleistocene is a geological period extending from about 2.5 million to 12,000 years ago.

- During the mid-Holocene, the Hunter Valley (particularly close to the eastern end of the present investigation area) was infilled with marine to brackish water in an estuary stretching 32 kilometres inland from the present coastline. The presence of estuarine resources adjacent to the forests would have provided more abundant subsistence resources in this location than hitherto had been available and the area may have become attractive to Aboriginal people for the first time. However, potable water supplies may have remained largely ephemeral within the immediate vicinity of the investigation area, apart from along the higher order watercourses;

- After about 3,600 years BP a rapid decline in the sea level of approximately one metre occurred, although until 1,500 years BP the sea level may still have remained about one metre above the present level. As the sea level fell, the nearby Hunter River valley may have transformed from a shallow estuary to swamps and terrestrial floodplains. Most of the larger coastal rivers in south-eastern Australia experienced these changes during the late Holocene (last 4,000 years); and

- Since the arrival of non-indigenous settlers significant changes have occurred to the investigation area (and Hunter Valley environment in general), including changes to the hydrology and vegetation and impacts to the land surface.

2.6 Land Use History

Historical records indicate that there has been a long period (nearly two centuries) of non-indigenous use of the locality of the investigation area, including for settlements, pastoral and agricultural activities, and industry.

The Hunter region was identified by Lieutenant John Shortland on 16 September 1797. The river was named 'Coal River', which was changed to the 'Hunter River' in 1804, in honour of Captain John Hunter, second Governor of NSW (Windross and Ralston 1897). The local Aboriginal people new the Hunter River as 'Coquun' and it was noted in the 1886 NSW Gazette as such (Anon 1904:12, 93).

A penal station, initially known as 'King's Town', was established at Newcastle in 1804. Settlements were established at various points along the river between 1812 and 1824. In 1818 the Commandant of Newcastle, Captain James Wallis, placed eleven convicts on the alluvial flats where West Maitland is now located, and several others on the Paterson River, to engage in agricultural pursuits to supply produce to Newcastle. Maize, butter, poultry and eggs were produced (Hartley 1995). Newcastle became an important port as the valley subsequently flourished through timber, wool, beef, dairy and coal mining industries (Wood 1972).

Free selecting of land commenced on a small scale on the Hunter River in 1821 or 1822 (Windross and Ralston 1897). After the penal settlement of Newcastle was transferred to Port Macquarie in 1823, Assistant Surveyor Henry Dangar was instructed to survey the Hunter Valley with the view to opening it to settlement (Hartley 1995). Henry Dangar (1828) wrote that by November 1825, there were 372,141 acres appropriated to 792 persons, 132,164 acres allotted for church and schools, and 100,000 acres reserved for Government. At this time, the earliest non-indigenous settlers were exporting over 200 tonnes of farm produce weekly (Windross and Ralston 1897:14).

Convict gangs were employed by the new land owners to clear the area and by 1824 there were 1,150 men employed in these gangs (Mitchell 1984:21). During the 1830s Maitland was in the midst of an economic boom which in turn resulted in an increase in population and investment. In the late 1830s industry located in the area included a soap and candle factory, a tobacco factory and four steam powered flour mills (Barney 1998:105). In 1843 its population had risen to 2,769, second only to Parramatta as the largest town in the Colony outside of Sydney.

In the early days there was no real road to Newcastle and the majority of travel was undertaken via the Hunter River. Tenders were called in 1854 to construct a railway line from Hexham to East Maitland. The line reached Maitland by 1858 and, although shipping continued until the 1950s, the importance of Morpeth as a port declined (Preston 1982:9). The railway was more important for the transportation of coal and people. The Main Northern Railway, which traverses the centre of the present investigation area, was extended north to Singleton in 1863.

From the 1840s to 1870s settlement extended into the hilly terrain (Dean-Jones and Mitchell 1993:2). Grazing sheep and cattle were the primary activities, but along the floodplain of the river, maize, potatoes, wheat, barley and later tobacco were cultivated (Dean-Jones and Mitchell 1993:2). Extensive tree clearing, ringbarking and sapping to improve grazing capacity, occurred in the upper Hunter from 1862 (Dean-Jones and Mitchell 1993:2). Improved pastures were widely established on river flats and irrigation was used to develop the dairy cattle industry (Dean-Jones and Mitchell 1993:2). Timber getting was also an important industry from the initial non-indigenous settlement and by 1815 had reached considerable proportions (Windross and Ralston 1897:17).

As indicated by this historical review (refer also to photographs in Appendix 3), recent non-Aboriginal land-use practices have extensively affected the investigation area. These impacts have included:

- Widespread removal of native vegetation;
- Pastoral activities;
- Agricultural activities;
- Rural and residential use (including houses, buildings, dams and fences);
- Construction, maintenance and use of the Main Northern Railway;
- Essential services (power, gas pipelines, telecommunications and water and sewage pipelines);
- Erosion control works (for example, contour banks, dams and drains);
- Construction, maintenance and use of roads, including well-formed roads and lightly formed or unformed vehicle tracks; and
- Other focalised impacts such as earthworks and material stockpiles.

These impacts are likely to have reduced the integrity of artefact evidence within many portions of the investigation area, and totally removed many other forms of heritage evidence (for example, scarred trees) had they once been present (including within the *unmodified investigation area*). However, sub-surface deposits of artefacts may still occur within the unmodified investigation area where disturbance levels are lower and/or a relatively deeper A unit soil exists, and other forms of heritage evidence may still remain.

Approximately 95.5 hectares or 27% of the investigation area has been extensively impacted by earthmoving works, typically associated with construction of the Main Northern Railway, such that there is negligible potential for any Aboriginal heritage evidence to survive (*modified investigation area*). These areas are marked as "modified" on Appendix 1.

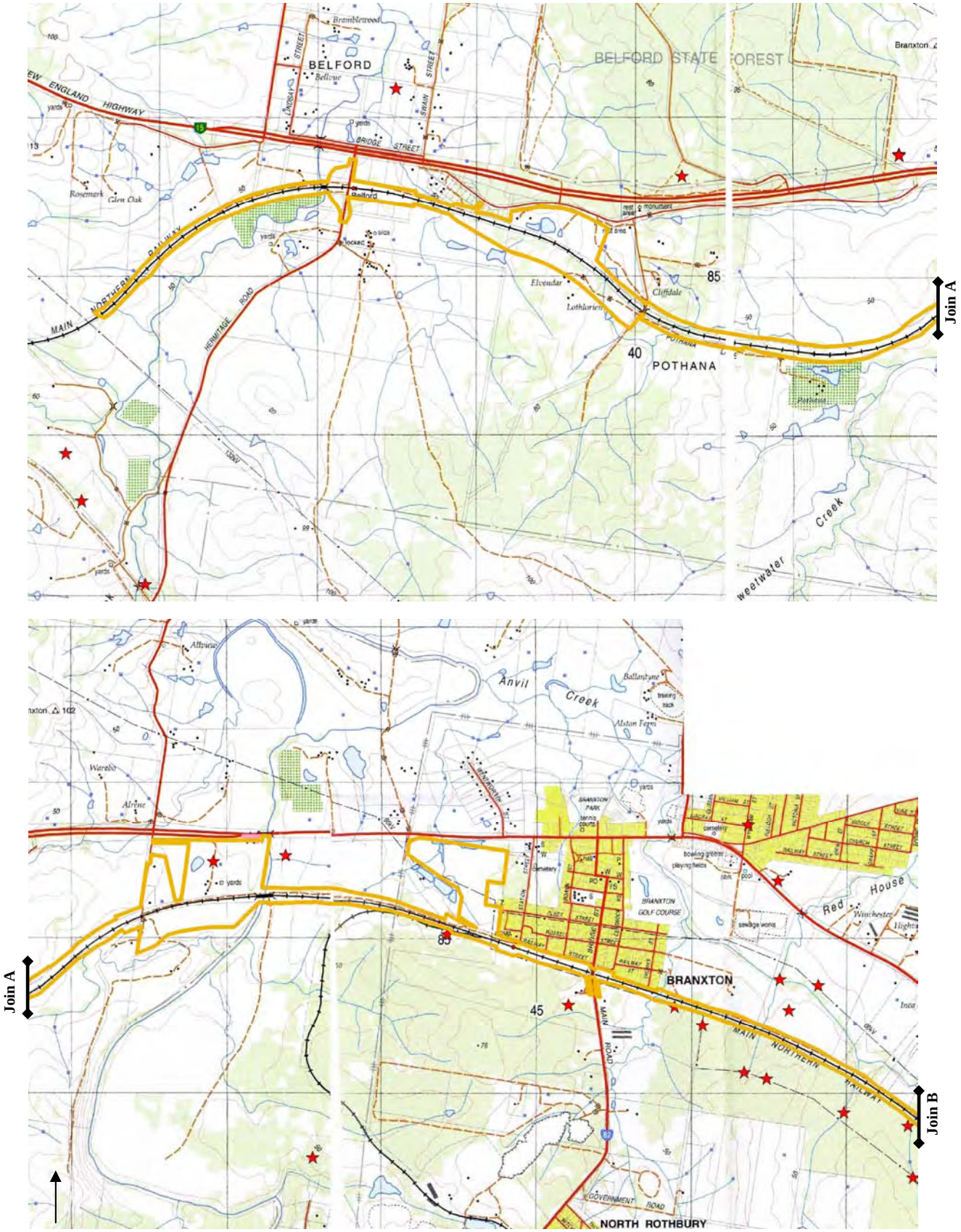


Figure 2.1 (a): Topographic context of investigation area (orange outline) and location of previously recorded Aboriginal heritage sites (red stars) (base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; Aboriginal site locations courtesy DECCW AHIMS).

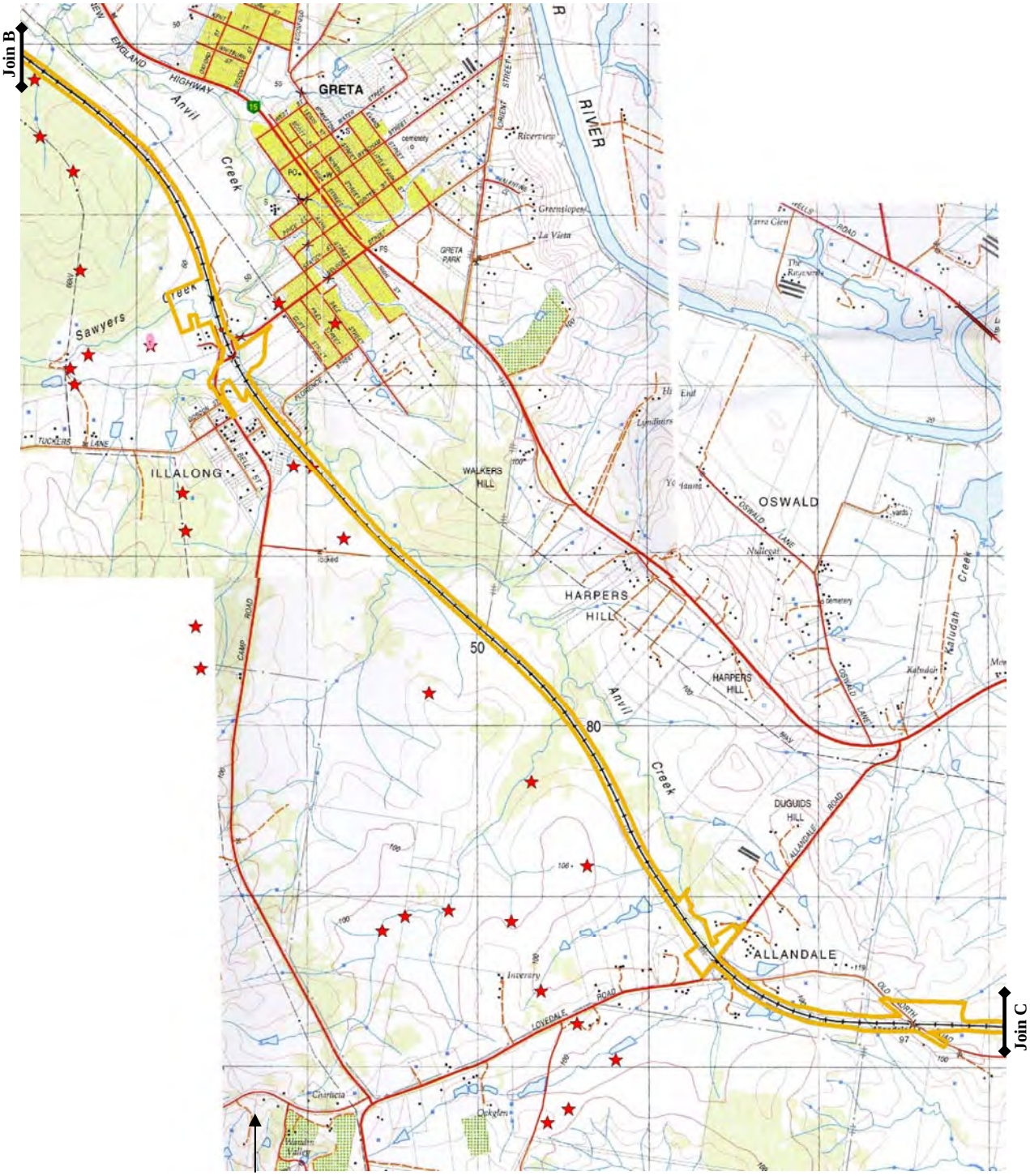


Figure 2.1 (b): Topographic context of investigation area (orange outline) and location of previously recorded Aboriginal heritage sites (red stars) (base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; Aboriginal site locations courtesy DECCW AHIMS).

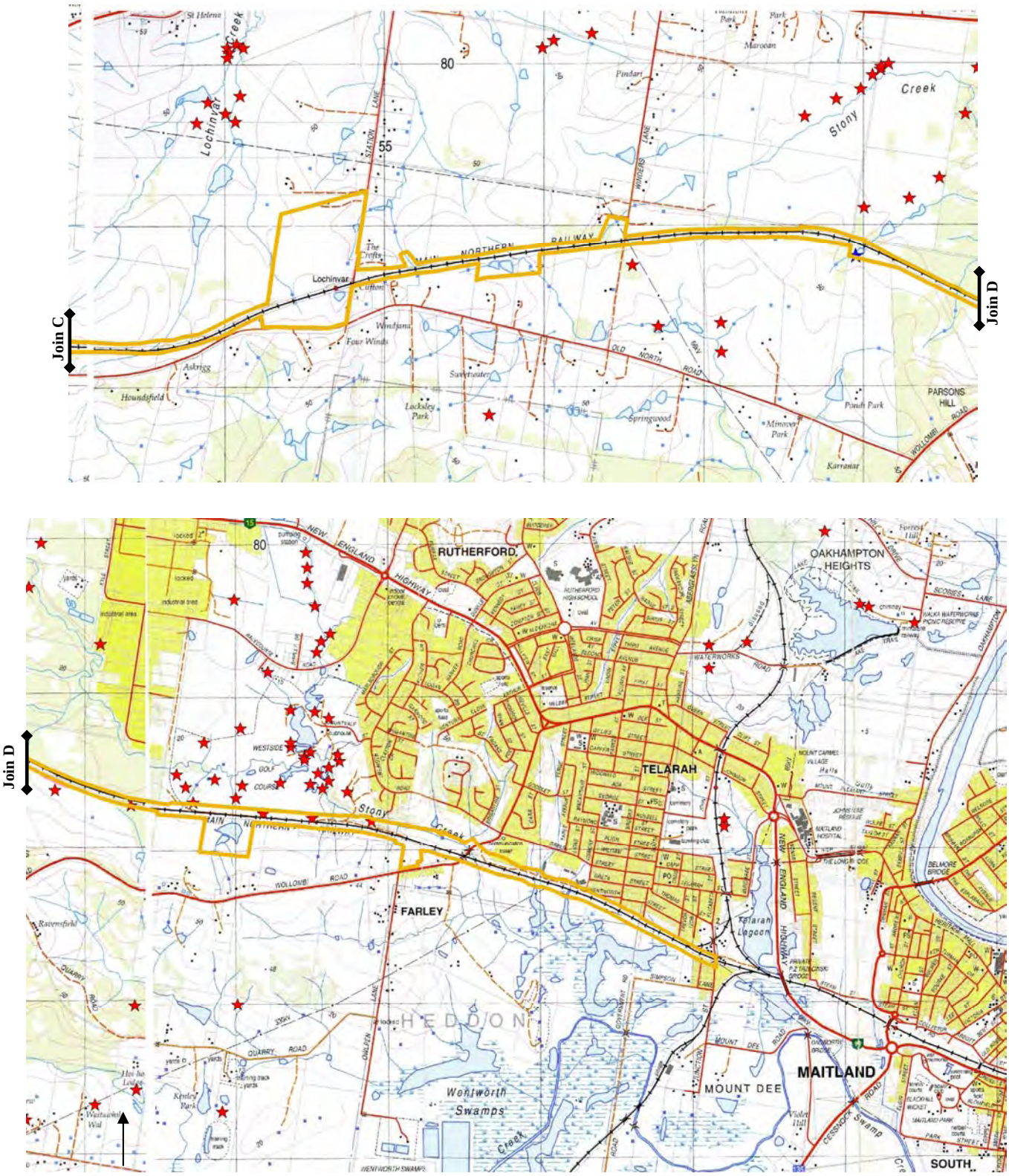


Figure 2.1 (c): Topographic context of investigation area (orange outline) and location of previously recorded Aboriginal heritage sites (red stars) (base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; Aboriginal site locations courtesy DECCW AHIMS).

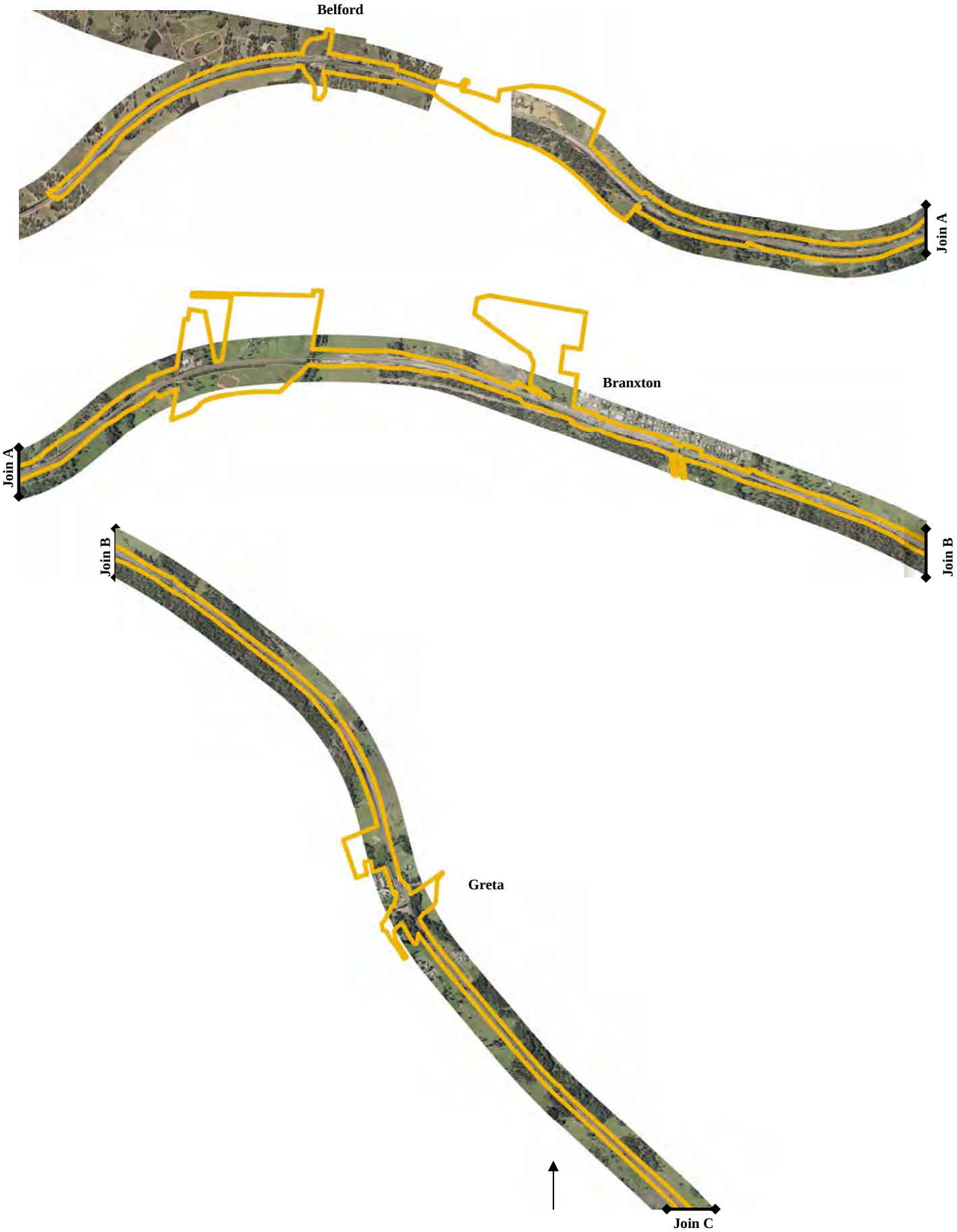


Figure 2.2(a): Aerial photograph of investigation area (courtesy Hunter 8 Alliance).

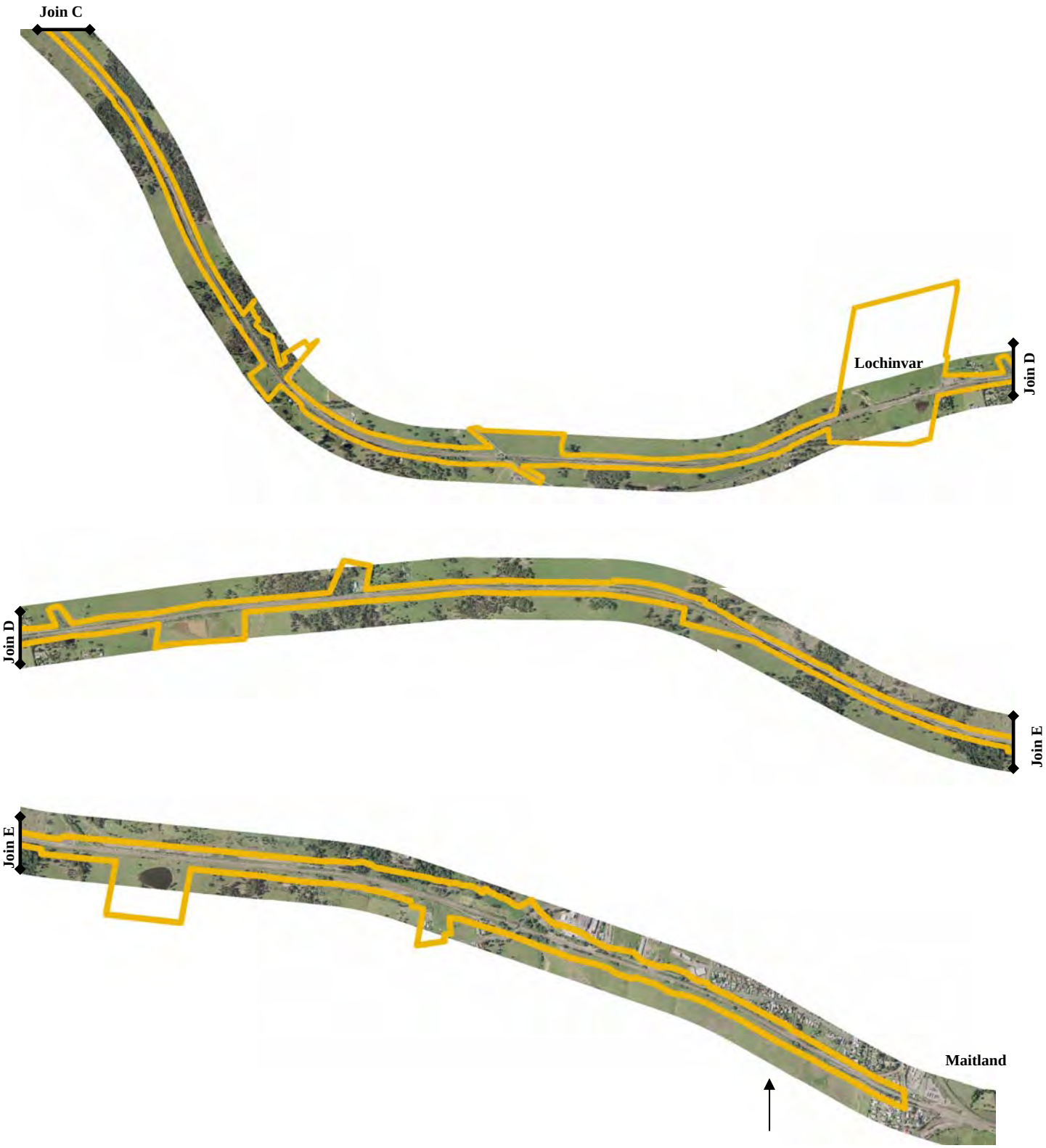


Figure 2.2(b): Aerial photograph of investigation area (courtesy Hunter 8 Alliance).

3. ABORIGINAL HERITAGE CONTEXT

3.1 Heritage Register Searches

Searches (#26239 and 26240) were undertaken in June 2009 and search #26753 was undertaken in August 2009 of the DECCW Aboriginal Heritage Information Management System (AHIMS) of a 141 square kilometre zone encompassing the present investigation area (refer to Figure 2.1 and Appendix 1). Within this zone, 148 Aboriginal sites have previously been recorded, most of which are open artefact scatters or isolated artefacts, in addition to five Potential Archaeological Deposits (PADs). One 'burial - Aboriginal ceremonial and dreaming' site, two 'Aboriginal resource and gathering' sites and eight grinding groove sites are included in this total.

Previous search results (Kuskie 2008a) were relied upon for the western-most 2.7 kilometres of the investigation area. This search of a 156 square kilometre zone extending towards Singleton listed 65 Aboriginal sites, all open artefact scatters or isolated artefacts.

Thirteen Aboriginal sites have previously been recorded within approximately 50 metres of or directly in the investigation area and are listed on the DECCW AHIMS register (refer to Table 3.1, Figure 2.1 and Appendix 1). These sites are all open artefact sites and are discussed further in Section 6.2, with details presented in Appendix 3.

In addition, one isolated artefact ('Farley C') that is not listed on the AHIMS register but has previously been reported by Dyall (1979) also occurs within the investigation area.

No Aboriginal heritage sites are listed within the investigation area on the State Heritage Register, or under the *Environment Protection and Biodiversity Conservation Act 1999* on the Register of the National Estate, National Heritage List or Commonwealth Heritage List, or on the *Singleton Local Environmental Plan 1996, Cessnock Local Environmental Plan 1989, Maitland Local Environmental Plan 1993* or *Hunter Regional Environmental Plan* 1989, or under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

3.2 Previous Archaeological Research

A number of archaeological surveys and excavations have been conducted within the locality of the investigation area and within the wider Hunter Valley region, in a commercial contracting framework. Discussion of the most relevant investigations will highlight the range of site types and variety of site contents in the region, identify typical site locations, and assist with the construction of a predictive model of site location for the investigation area.

Western End of Investigation Area - Minimbah, Belford Locality:

Immediately adjacent to and overlapping for several hundred metres with the western end of the present investigation area, Kuskie (2008a) undertook an Aboriginal heritage assessment for the Minimbah Bank Third Track Project. The Hunter 8 Alliance is constructing a third rail track along the Main Northern Railway. The project involves approximately 11 kilometres of track and earthworks, three new rail underbridges, grade separation of the Range Road level crossing, replacement and realignment of the Golden Highway overbridge, relocation of essential services and signalling works.

Table 3.1: Previously recorded Aboriginal sites on DECCW AHIMS register directly in or within approximately 50 metres of the investigation area.

DECCW AHIMS #	Site Name	AGD Easting	AGD Northing	Site Type	Recorder
37-6-1315	Anvil Creek RTA 13 IF	344320	6384836	Open artefact site	Umwelt
37-6-1324	Anvil Creek RTA 22	345784	6384373	Open artefact site	Umwelt
37-6-1339	Black Creek RTA 2	343100	6385460	Open artefact site	Umwelt
37-6-1340	Black Creek RTA 3	342812	6385305	Open artefact site	Umwelt
37-6-1370	Anvil Creek RTA 29 (formerly PAD18 Anvil Creek)	347289	6383607	Open artefact site	Umwelt
37-6-1371	PAD20 Black Creek	343052	6385455	Open artefact site	Umwelt
37-6-1665	Greta Village Estate - 2 (GVE-2)	348917	6381332	Open artefact site	AECOM (HLA)
37-6-0119	Lochinvar; Farley; E;	359200	6378100	Open artefact site	Dyall
37-6-0120	Lochinvar; Farley; F;	358700	6378200	Open artefact site	Dyall
38-4-0714	Heritage Green 24/A	360780	6378000	Open artefact site	Kuskie
38-4-0719	Heritage Green 17/C	360390	6378020	Open artefact site	Kuskie
38-4-0722	Heritage Green 17/D	360070	6378050	Open artefact site	Kuskie
38-4-0732	Heritage Green 21/B	359610	6378120	Open artefact site	Kuskie

The study area measured approximately 11.3 kilometres in length by 250 metres in width, for a total area of 283 hectares, and extended west from the current investigation area towards Singleton. Approximately 92.5 hectares comprised land that had been extensively impacted by earthmoving works and construction of the existing railway line and New England Highway, such that there was negligible potential for any Aboriginal heritage evidence to survive. The remaining "unmodified area" of 190 hectares was subdivided and inspected within 80 environmentally discrete survey areas. The survey was undertaken in July 2008 with assistance from representatives of the ten registered Aboriginal stakeholders that responded to the methodology and/or selection criteria and sought further involvement in the project (Wanaruah LALC, Lower Hunter Wonnarua Council, Gidawaa Walang, Ungooroo Cultural and Community Service, Wattaka Wonnarua Cultural Consultants Service and Yarrawalk Enterprises).

The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 12.3% of the unmodified study area, and involved traversing the entire length of the rail route. The total effective survey coverage (*visible* ground surface physically inspected, with potential to host heritage evidence) equated to around 0.5% of this area (Kuskie 2008a).

A total of 30 Aboriginal heritage sites, all isolated stone artefacts or small artefact scatters, had been recorded within the study area, mostly during the survey undertaken by South East Archaeology in July 2008. Kuskie (2008a) concluded that the identified artefact evidence occurred in a very low density distribution, with a very low potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value, apart from in survey area M5. At sites M5/A and M5/B and elsewhere within survey area M5, Kuskie (2008a) concluded that there was a high potential for sub-surface deposits of artefacts to occur and although the integrity of any deposits is uncertain, evidence that is *in situ* and/or of research value could not be discounted.

The identified sites were assessed as being of low scientific significance within a local context, due to their common nature, low representative value, low integrity, limited range of artefact and stone material types, and generally limited potential for deposits that may be *in situ* and/or of research value (Kuskie 2008a). The primary recommendations arising from the assessment were that provisions relating to Aboriginal heritage should be included in an Environmental Management Plan for the project, with surface collection of identified sites prior to impacts and surface scrapes as a mitigation measure within survey area M5 (Kuskie 2008a).

Subsequent to Part 3A approval being granted for the Minimbah Bank Third Track Project, the salvage of Aboriginal sites within the impact zone and survey of additional areas proposed for site compounds, soil stockpiles and other works that were outside of the original investigation area, was undertaken by South East Archaeology. The salvage and additional survey was conducted between July and November 2009, with the assistance of representatives of the registered Aboriginal stakeholders that were involved in the initial survey. Twenty of the previously recorded sites were relocated and subject to surface collection. Five previously recorded sites within the impact zone could not be relocated. Twenty additional open artefact sites were identified within the additional survey areas, and all of these were subject to surface collection.

McCardle (2005a) conducted a preliminary assessment of a proposed train support facility for Queensland Rail at Minimbah. The investigation area of approximately 12 hectares encompassed a 2.7 kilometre length alongside the southern side of the Main Northern Railway, west of the present investigation area toward the Golden Highway.

Eight Aboriginal organisations registered an interest in the project, of which three (Wanaruah LALC, Ungooroo Aboriginal Corporation and Aboriginal Native Title Elders Consultants) were selected for paid participation in the field survey. The survey was undertaken on 12 October 2005 by five persons, spaced at five metre intervals, and focused on areas of high ground surface visibility. McCardle (2005a:30) estimated that a total survey coverage of 247,338 m^2 was achieved, with effective survey coverage (accounting for visibility) of 67,418 m^2. Given that McCardle's study area itself is stated to comprise 12 hectares (120,000 m^2), either this calculation is incorrect or substantial areas were inspected outside of that study area or the estimated survey coverage represents an overinflation of the actual coverage. Assuming a field surveyor realistically covers a width of two metres each, the level of coverage stated by McCardle (2005a) would represent a distance traversed of 24.7 kilometres for each person in a single day.

McCardle (2005a) subdivided the area into three survey units (SU1, SU2 and SU3) according to areas of proposed development rather than environmental characteristics. Survey Unit 1 is described as encompassing a simple slope and SU2 and SU3 simple slopes and drainages. McCardle (2005a) identified two isolated artefacts, #37-6-1605 ("QR1") and #37-6-1606 ("QR2"), west of the Main Northern Railway and south of the Golden Highway. McCardle (2005a:35) concluded that:

> "The results indicate that there was little use of the area. Its location within the landscape and lack of resources such as reliable water with associated food and material resources would have contributed to the apparent absence of occupation within the study area. The evidence indicates this was not an area conductive (sic) to continued and sustained occupation. However, it appears to have been an area travelled upon as indicated by the isolated artefacts identified. Although the majority of study area (sic) has been subject to disturbances, there is no evidence to suggest anything other than isolated finds would be present. This level of disturbance is such that it is considered that there is very limited potential for sub-surface deposits" (McCardle 2005a:35).

The investigation of this area by South East Archaeology in July 2008 led to the identification of 14 Aboriginal sites in the same area (Kuskie 2008a).

McCardle (2005a) assessed the significance of the evidence as low and recommended that Queensland Rail obtain a Section 90 Consent for the isolated artefacts, with collection and monitoring of initial ground disturbance works (throughout the entire study area).

McCardle (2005b) investigated a proposed rezoning of 345 hectares of rural lands between Singleton and Belford. This area is located adjacent to the Main Northern Railway, immediately north of the Golden Highway, and on the eastern to northern side of the New England Highway, approximately 1.5 kilometres north-west of the present investigation area. The area comprises undulating terrain and drainage depressions that drain into the nearby Hunter River. McCardle (2005b) identified 29 artefacts scatters and 10 isolated artefacts, in addition to evidence previously reported within the area. The sites were dominated by the stone materials tuff (59% of the combined assemblage) and silcrete (35%). Flakes (44% of the combined assemblage), flake portions (20%), cores 7.5%) and flaked pieces (22%) dominated the artefact types. Four sites contained between 20 and 50 artefacts, and two sites had over 50 artefacts each.

Effenberger (1993a) investigated the abattoir between Belford and Singleton, located immediately north of the Singleton Army Base, about two kilometres west of the present investigation area. Transects were surveyed across portions of the 45 hectare area on 29 March 1993. Three isolated artefacts were located in erosion scours near the fence along Minimbah Road, a silcrete flake, a tuff core and a silcrete flake. However, these items were dismissed by Effenberger (1993a) as being of low significance and do not appear to have been listed on the DECCW AHIMS register. Effenberger (1993a) recorded one artefact scatter site east of Minimbah Road and the abattoir storage tank. This site ("Belford West") was listed on DECCW AHIMS as "Mitchell Line" (#37-6-605). It comprised 11 artefacts, all flakes of silcrete and possibly volcanic stone.

Further investigation was undertaken of the abattoir landholdings by Effenberger and Kitchener (1997), focusing on a 48 hectare area approaching to within a kilometre of the present investigation area, in response to issues raised by the National Parks and Wildlife Service. A survey was undertaken over two days in September 1997 with representatives of the Wanaruah LALC and Wonnarua Tribal Council. Transects were inspected, along with opportunistic sampling of erosion scours. The survey resulted in the identification of an additional 12 artefact sites, to those initially recorded in 1993. None of these sites appear to have been listed on the DECCW AHIMS register. The sites were noted as containing tuff, silcrete and chert artefacts, and ranged from isolated finds to up to 100 flakes at knapping floors (Effenberger and Kitchener 1997:17).

Davies (1991) surveyed the route of a Telecom optical fibre cable, between Cessnock and Scone. The route traverses partially adjacent to the New England Highway near the present investigation area between Minimbah and Branxton. One artefact scatter site was located along the 27 kilometre route.

Ruig (1993) investigated a Telstra cable extending north from Belford along Lower Belford Road and several adjoining roads for approximately 2.7 kilometres. The route commences approximately several hundred metres north of the western portion of the present investigation area, west of Hermitage Road. Two isolated artefacts, a small artefact scatter (two artefacts) and a large artefact scatter (85 artefacts) were identified. The large site ('Belford 2', DECCW #37-6-630) contained predominantly silcrete which Ruig (1993) inferred derived from reduction of a single cobble.

Hughes (1984) investigated the Belford Deviation of the New England Highway extending three kilometres east from Belford to Black Creek. This area is also located several hundred metres north of the western portion of the present investigation area. One artefact scatter (DECCW #37-6-332) with 15 artefacts was located at Jump-up Creek at Belford. The artefacts comprised silcrete and tuff cores, flakes and flaked pieces. Effenberger (1993b) later reassessed the site and proposed Belford Deviation.

Hamm (2008) investigated the 40 hectare area of Lot 104 DP 882932, Hermitage Road, Belford, for the proposed Pokolbin Waters Resort. It is located adjacent to the western end of the present investigation area. Fifteen open artefact sites were identified, containing a total of 447 recorded artefacts. The sites are mostly located 30 to 150 metres south-east of Jump-Up Creek on low alluvial flats and terraces, but also occur on ridge crests or other drainage depressions within the study area. Silcrete dominates the combined artefact assemblage (79%), followed by tuff (17%). The assemblage primarily comprised flakes (32%) and flake portions (44%), with flaked pieces (11%) and cores (7%) also common (Hamm 2008).

Perry (1999) and members of the Wonnarua Tribal Council surveyed a proposed water pipeline route between the Hunter River, near Singleton, and Pokolbin. The route is not mapped but appears to traverse across the present investigation area in the vicinity of Belford and Minimbah. Nineteen open artefact sites (WP1-19) were located, some extending over large areas and with substantial numbers of artefacts. Site WP 10 (DECCW #37-6-822) is located approximately 900 metres south of the western end of the present investigation area, and comprised a single silcrete artefact.

Perry (2000) also examined a proposed gas pipeline from Kyle Street at Rutherford to Singleton. The route traverses within road easements, including the New England Highway. Four open artefact sites were identified, north of the present investigation area. These comprised low numbers of tuff and silcrete artefacts.

Western Section of Investigation Area - Branxton, Rothbury Locality:

The Branxton Waste Water Treatment Works (WWTW) is located about 500 metres north of the present investigation area, at the junction of two higher order watercourses, Anvil Creek and Red House Creek, immediately east of Branxton and the Branxton Golf Course. Benton (OzArk 2007) undertook an initial assessment of part of the WWTW for a proposed upgrade. The investigation area was primarily confined to a limited area within the centre of the WWTW that had already been substantially impacted by earthworks, apart from a minor pipeline leading to the adjacent Anvil Creek.

Benton (OzArk 2007) surveyed the WWTW investigation area, in consultation with the Mindaribba LALC but in the apparent absence of a LALC representative. Benton (OzArk 2007) reported 'Redhouse Creek 1b/PAD' as a 'site' within the WWTW. The PAD (not an Aboriginal 'site' as it does not contain identified Aboriginal objects) was registered with DECCW as #37-6-1720, but the grid reference is inaccurate by several hundred metres. Notwithstanding that Aboriginal objects had not been identified, OzArk (2007) recommended that the proponent apply for a Section 90 AHIP for the PAD.

An Aboriginal heritage assessment of the WWTW has been completed by South East Archaeology (Kuskie 2009a). The assessment involved an area of 7.5 hectares within and immediately adjacent to the WWTW. The survey was undertaken on 24 September 2009 and involved comprehensive coverage (approximately 40% direct sample) of the 4.5 hectares of the study area in which there was some potential for heritage evidence. One Aboriginal site was located ('BWWTW 2/A', an isolated artefact), although impacts are not proposed to occur to this item (Kuskie 2009a).

South East Archaeology (Kuskie 2009b) also investigated a proposed 10 kilometre length of rising main (raw water pipeline) leading from the WWTW through the Branxton Golf Course and urban area of Branxton and south along the road corridor of Wine Country Drive via North Rothbury, to 'The Vintage' Residential Golf Course at Rothbury. This route traverses the present investigation area where Wine Country Drive crosses the Main Northern Railway. One open artefact site was identified in the Branxton Golf Course, six open artefact sites were identified along the verges of Wine Country Drive, and one on the verge of McDonalds Road.

A proposal to develop a large area extending from immediately south of the Main Northern Railway at Branxton, to North Rothbury, east from Wine Country Drive to Anvil Creek and west of Wine Country Drive to Sweetwater Creek, and south to Old North Road, has been put forward by Huntlee Holdings Pty Ltd as 'Huntlee New Town'. The proposal includes up to 600 hectares of residential development, up to 93 hectares of rural-residential development, up to 160 hectares of employment associated development, associated infrastructure and 876 hectares of conservation (west of Wine Country Drive around Black Creek) (JBA Urban Planning Consultants Pty Ltd 2007). A very preliminary level 'Aboriginal heritage assessment' was undertaken by Roberts (2003 and 2005) of the Huntlee project. A detailed Aboriginal heritage assessment consistent with DECCW guidelines has not been undertaken.

Approximately 1.5 kilometres south of the present investigation area, Carter (2005) investigated the 4.6 hectare area of Lot 138, Hanwood Road. The property borders Black Creek, west of North Rothbury. Fourteen artefacts were identified in six separate loci (registered as DECCW #37-6-1927).

Approximately seven kilometres south of the present investigation area and Branxton lies 'The Vintage', an integrated tourist, residential and golf course development. Aboriginal heritage investigations have been conducted into 'The Vintage' and adjacent land, initially by Brayshaw (1988) and subsequently by South East Archaeology (Kuskie 1996, 2002a, 2002b, 2003, 2004a, 2004b, Kuskie and Clarke 2005, 2006a, Kuskie and Parkes 2002). These investigations have resulted in the location of a number of Aboriginal heritage sites, primarily surface scatters and deposits of stone artefacts, along with a silcrete lithic quarry. Surveys, surface collections, monitoring and salvage excavations have been completed.

Mid-Section of Investigation Area - Greta, Allandale Locality:

One kilometre south of Greta and immediately south of the present investigation area, an area of 423 hectares was assessed by HLA-Envirosciences (2005) for the proposed 'Anvil Creek' development. The area comprised Lots 2-6 DP 1036942, Lot 1 DP 874323 and Lots 263 and 264 DP 755211. It is bounded to the north by the Main Northern Railway, to the south by the proposed F3 extension, and to the west by Camp Road.

An initial survey of the Anvil Creek development was undertaken in September 2002 with the Mindaribba LALC and Lower Hunter Wonnarua Council, with 39 transects inspected on foot and six by vehicle. It is claimed that 153 hectares was traversed during the four day survey, although the basis of this calculation is not clear. The survey resulted in the identification of 11 open artefact sites and one previously recorded site was re-recorded (HLA-Envirosciences 2005). However, these sites appear to represent broad areas, with multiple locations of visible evidence identified within many of the broad site areas. Site 'Greta Village Estate 2 (GVE2, DECCW #37-6-1665) was recorded within the present investigation area, and loci that form part of sites 'GVE-1' (#37-6-1658) and 'GVE-6' appear to be located in close proximity to the present investigation area. These sites are discussed further in Section 6.

A total of 215 artefacts were recorded, with 82 in site GVE-4, 54 in GVE-6, 38 in GVE-1, and 13 or less in the remaining sites. The artefacts predominantly comprised flakes, with a low number of retouched flakes (five of which were backed artefacts). Three definite and one possible hammerstone were reported, along with a 'sandstone slab which may show signs of surface grinding'. Silcrete represented just over half of the assemblage, with tuff and 'mudstone' also common. A program of test excavation was recommended to further investigate the sites (HLA-Envirosciences 2005).

Mid-Section of Investigation Area - Lochinvar Locality:

The Thornton Land Company proposes to develop a French provincial themed residential village on a 53 hectare site at Lochinvar, approximately 500 metres north of the Station Lane portion of the present investigation area. The area comprises Lot 3 DP 634523, Lot 1 DP 979240 and Part Lot 28 DP 633208 and is located immediately south-west of Lochinvar. It is bordered by the New England Highway to the north and adjoining rural properties to the east, west and south. It is primarily dominated by very gently to gently inclined simple slopes and spur crests descending to Lochinvar Creek and several of its tributaries.

An initial archaeological survey of much of the area was undertaken by HLA Envirosciences on 22 July 1994, with the Mindaribba LALC. This assessment resulted in the identification of one isolated artefact ('Loch-1', DECCW #37-6-670) which Stuart (1994) assessed as being of low significance.

A second archaeological inspection of the same area was undertaken by Roberts (2004) on 12 March 2004 for Durndrax Pty Ltd, accompanied by representatives of the Mindaribba LALC and Lower Hunter Wonnarua Council. Roberts (2004) subdivided the study area into just three landform units ('Slope 1', 'Slope 2' and 'Creek') and claims to have surveyed each unit, 'with particular emphasis and attention to the creek and drainage lines'. Roberts (2004) did not relocate Stuart's isolated artefact and did not identify any other heritage evidence within the property, nor any potential for sub-surface deposits along the drainage lines.

South East Archaeology was engaged by the Thornton Land Company in 2004 to prepare a Section 90 application for the one known isolated artefact on the property (#37-6-670). During a brief on-site meeting in August 2004, two Aboriginal sites were immediately identified (L10/A and L22/A). It became apparent that further inspection and recording of the study area was essential in order to comply with the requirements of a Section 90 application. Additional survey of the property, including the north-western section which previously had not been subject to inspection, was conducted by South East Archaeology and the Mindaribba LALC and Lower Hunter Wonnarua Council on 10 and 11 August 2004.

A total of 12 Aboriginal site loci were identified, all stone artefact occurrences. Site loci L20/A, L20/B, L21/A, L21/B, L21/C, L22/A, L22/B and L22/C were identified along Lochinvar Creek or its major tributary. Three sites were located on elevated terrain away from the main watercourses, L4/A, L4/B and L10/A. Stuart's isolated find (Loch-1) could not be relocated, however another artefact was identified in this location. In summary, the sites comprised:

- Loch 1 (#37-6-670) - two artefacts, a silcrete or chert flake recorded by Stuart (1994) and a banded rhyolite core recorded by Kuskie and Clarke in 2004, located within an 8 x 2 metre exposure created by vehicles, stock and erosion at a gate along a fence line, on a gently inclined first order drainage depression;

- Lochinvar 4/A (#37-6-1423) - one artefact, a large grey quartzite core, identified during the August 2004 survey by South East Archaeology on a very gently inclined spur crest come simple slope, 19 metres west of Lochinvar Creek. This artefact probably represents local or on-site procurement and reduction of one of a number of naturally occurring quartzite cobbles in the study area;

- Lochinvar 4/B (#37-6-1424) - two artefacts, a tuff longitudinal flake portion and a tuff core, identified during the August 2004 survey by South East Archaeology on a very gently inclined spur crest come simple slope, east of a major tributary of Lochinvar Creek;

- Lochinvar 10/A (#37-6-1425) - one artefact, a tuff proximal flake portion, identified during the August 2004 survey by South East Archaeology on a gently inclined spur crest, within 40 metres north of Lochinvar Creek;

- Lochinvar 20/A (#37-6-1426) - one artefact, a silcrete core, identified during the August 2004 survey by South East Archaeology along the very gently inclined Lochinvar Creek;

- Lochinvar 20/B (#37-6-1427) - one artefact, a tuff flake, identified during the August 2004 survey by South East Archaeology along the very gently inclined Lochinvar Creek;

- Lochinvar 21/A (#37-6-1428) - one artefact, a silcrete flake, identified during the August 2004 survey by South East Archaeology along the very gently inclined Lochinvar Creek;

- Lochinvar 21/B (#37-6-1429) - one artefact, a silcrete longitudinal flake portion, identified during the August 2004 survey by South East Archaeology along the very gently inclined Lochinvar Creek;

- Lochinvar 21/C (#37-6-1430) - two artefacts, both tuff flakes, identified during the August 2004 survey by South East Archaeology along the very gently inclined Lochinvar Creek;

- Lochinvar 22/A (#37-6-1431) - four artefacts, two tuff retouched flakes, a tuff core and a silcrete proximal flake portion, identified during the August 2004 survey by South East Archaeology along the very gently inclined third order tributary of Lochinvar Creek;

- Lochinvar 22/B (#37-6-1432) - three artefacts, two silcrete flakes and a silcrete distal flake portion, identified during the August 2004 survey by South East Archaeology along the very gently inclined third order tributary of Lochinvar Creek; and

- Lochinvar 22/C (#37-6-1433) - at least 19 artefacts, including a quartzite flake portion, five tuff flake portions, a tuff flake, four silcrete flake portions, five silcrete flakes, two silcrete retouched flakes and a silcrete microblade core, identified during the August 2004 survey by South East Archaeology along the very gently inclined third order tributary of Lochinvar Creek.

Although the potential for sub-surface deposits was considered to be limited on the elevated terrain units due to the skeletal nature of the soil, typically a deeper A unit soil was present along the major watercourses (survey areas L20, L21 and L22). Potential was considered to remain in these contexts for sub-surface deposits of artefacts that may be of research potential in relation to locally relevant research questions. Although formal reporting of the survey results was not required, a Section 90 Consent and Salvage Permit (#2421) was subsequently issued by DECCW over this area.

Dyall (1979, 1980) surveyed an area consisting of low ridges and three watercourses draining into Wentworth Swamp, for a proposed aluminium smelter. This broad area extends from immediately east of the Station Lane portion of the present investigation area for about four kilometres, and as far north in places as the New England Highway, and up to several kilometres south of the railway. The present investigation area traverses Dyall's study area along a maximum length of almost five kilometres.

Twelve artefact scatters and three grinding groove sites (with between nine and 68 grooves) were initially recorded during the brief four-day survey. The total number of artefact scatters was revised to 17 (Dyall 1980). Two of these sites are listed on the DECCW AHIMS register (#37-6-119 and 37-6-120) as being located within or adjacent to the present investigation area (refer to Appendices 1 and 3 and Section 6). Section 90 Consent was issued by the then NPWS for both sites and the artefacts were collected by Dyall (1980).

Site #37-6-119 ('Lochinvar Farley E') is described as an open artefact scatter of five artefacts, located along a 20 metre section of the sandy southern margin of the railway vehicle track on the southern side of the railway. The artefacts comprised four rhyolite flakes and one chert flake.

Site #37-6-120 ('Lochinvar Farley F') is described as an open artefact scatter of four artefacts, located along a 400 metre section of the railway vehicle track on the southern side of the railway. The grid reference refers to the centre of the site and is assumed to be at least 50 metres south of its correct position. The artefacts comprised a flake, two 'used scrapers' and a 'used blade', of chert and acidic volcanic stone.

Mapping presented by Dyall (1979) indicates that a third open artefact site is located within the present study area, but is not registered on DECCW AHIMS. This site is marked on a tributary of Stony Creek, in the vicinity of MGA reference 357950:6378820 on the Greta 9132-1S 1:25,000 topographic map. It may correspond to Dyall's 'Lochinvar Farley C', an isolated artefact that is not listed on DECCW AHIMS.

The artefact scatter sites recorded by Dyall (1979) typically contained less than ten artefacts, but one site contained 195 items. The dominant ‘rhyolite’ (probably tuff) and ‘quartzite’ (probably silcrete) stone materials were considered to be available locally, eroding out of the clay soils as cobbles (Dyall 1979).

Dallas (1985) surveyed the 240 hectare 'Farley Downs' property, which encompassed part of the area inspected by Dyall (1980). It is bordered to the north by the Main Northern Railway, to the west by Winders Lane and to the south by Old North Road and Wollombi Road. The present investigation area traverses Dallas's study area for three kilometres along the southern side of the railway. No sites in addition to those recorded by Dyall were located, but additional artefacts were observed. Dallas (1985) described these as being predominantly ‘indurated mudstone’ (tuff) and red, yellow and grey silcrete, with minor frequencies of quartz, quartzite and chert. Dallas (1985) concluded that the evidence represented small scale and sporadic occupation of a 'marginal area'.

McCardle (2009) reinvestigated part of the area examined by Dyall (1979, 1980) north of the Main Northern Railway, south of the New England Highway, east of Winders Lane and west of the Rutherford Industrial Area. The present investigation area traverses McCardles' study area for 1.4 kilometres along the northern side of the railway. The area of 282 hectares was surveyed over three days in January 2009 with the Mindaribba LALC and Wonnarua Culture Heritage and on the final day with the Lower Hunter Wonnarua Council. Three 'survey units' were defined on the basis of property boundaries rather than in relation to landform units.

McCardle (2009) reported effective coverage of 254,500 m^2, or about 9% of the study area, which appears extraordinarily high in view of the dense grass cover across the property. Ten open artefact sites were identified (Rutherford Employment Area {REA} 1-10), all along Stony Creek or its tributary. These sites were attributed DECCW AHIMS numbers 37-6-1940 to 37-6-1949. McCardle (2009) describes eight of the sites as containing less than five artefacts, with site REA5 containing over 16 artefacts and site REA1 over 20 artefacts. Tuff (incorrectly termed 'mudstone') and silcrete appear to be the dominant stone materials.

Umwelt (2003a) investigated a proposed industrial estate at the Royal Newcastle Aero Club, Rutherford. The 143 hectare extends north from the New England Highway and west from Anambah Road to the Maitland Landing Ground, about 1.8 kilometres north of the present investigation area. In contrast to the results of a number of other studies in the locality, no heritage evidence was located and Umwelt (2003a) concluded that the archaeological potential of the area was low.

West of the Maitland Landing Ground, about 2.5 kilometres north of the present investigation area, Dallas and Kerr (1997) surveyed a 30 hectare property for a proposed rural-residential subdivision. An artefact scatter, two isolated finds and a potential deposit were identified by Dallas and Kerr (1997). The artefact scatter comprised four artefacts, mostly silcrete, located on a minor drainage line below a ridge crest or spur crest.

Ruig (1996, 1997) investigated the 'Penn Park' property, comprising Portions 62 and 63, Parish of Gosforth, on either side of the New England Highway approximately 1.2 kilometres north of the present investigation area. Following an initial survey, test excavations were undertaken. These involved a series of 44 test units (each measuring 1 x 0.25 metres in area) excavated along four 50 metre long transects placed on both sides of a watercourse. Hence a total of 11 square metres was excavated, to an average depth of around 0.24 metres. Only two artefacts were identified, a tuff flake and a tuff flaked piece. Ruig (1997) assessed the site as being of low scientific significance and a Section 90 Consent without further mitigation was recommended.

Eastern Section of Investigation Area - Rutherford, Maitland Locality:

Dagg (1996) investigated the industrial subdivision at West Rutherford, situated within 500 metres to the north of the present investigation area. Dagg's (1996) study area of approximately 102 hectares in size extended south from the New England Highway to the northern boundary of the Heritage Green residential golf course development area. Much of Dagg's study area was categorised as a 'drainage plain' and 'stream channel/banks'. The primary watercourse in Dagg's study area was termed 'unnamed tributary 1' and is a third order tributary of Stony Creek that flows from north to south through the eastern section of Dagg's area to its confluence at Heritage Green.

Dagg and representatives of the Mindaribba LALC surveyed the area over two days in 1996, walking transects through each of the landform units. A total of 18 transects were inspected. Dagg (1996) estimates that the survey sample measured in the order of 140,500 m^2 (or 13.7% of the study area) and the effective survey sample (*visible* ground surface physically inspected, with potential to host heritage evidence) equated to 15,796 m^2 or 1.5% of the study area. Seven artefact scatters (KS1 - DECCW #38-4-417, KS2 - #38-4-418 and KS4-KS8 - #38-4-420 to #38-4-424) and an isolated artefact (KS3 - #38-4-419) were located, comprising 88 stone artefacts, along with three PADs (PAD 1 - PAD 3).

Dagg (1996) concluded that the area was characterised by low density concentrations of artefacts, with the highest frequency associated with the confluence of watercourses. Apart from site KS1, all sites were situated within 40 metres of a watercourse. Sites KS1, KS2, KS3, KS5 and KS7 were assessed as being of low archaeological significance. Site KS4 was assessed as being of moderate archaeological significance and site KS6 of moderate to high archaeological significance. Dagg (1996) recommended that a program of sub-surface testing be conducted in areas of moderate or high archaeological sensitivity (defined by Dagg as sites KS4 and KS6 and PAD's 2 and 3).

Sub-surface testing of PADs 2 and 3 was subsequently undertaken by Umwelt (1997a), under Preliminary Research Permit #SZ143. The testing resulted in the identification of artefacts and subsequent reclassification of PAD 2 as site KS9 (#38-4-427) and PAD 3 as site KS10 (#38-4-428). Test units, each measuring 0.5 x 0.5 metres in area and mostly excavated in 0.1 metre spits, were dug at five metre intervals along 50 metre length transects at each site. Five transects (total of 51 units) were excavated at site KS9 parallel to the drainage depression, for a total surface area of 12.75 m^2 and volume of 2.13 m^3. Two transects (total of 22 units) were excavated at site KS10 parallel to 'unnamed tributary 1', for a total surface area of 5.5 m^2 and volume of 1.35 m^3. Excavation of the A unit soil typically terminated at the base of the unit at depths of around 0.17 metres (Umwelt 1997a).

A total of 25 artefacts were recovered from site KS9, from ten of the test units, and a further ten artefacts were found in a geotechnical test unit. Artefact densities ranged from 14 to 258/m^3, but the sample size is small. Silcrete was the dominant stone material (63%), followed by tuff (31%), quartz (3%) and petrified wood (3%). All artefacts were retrieved from 0-20 centimetres below the natural ground level (Umwelt 1997a). Six artefacts were recovered from site KS10, from three of the test units. Artefact densities ranged from 16 to 64/m^3, but the sample size is small. All artefacts were made of silcrete (Umwelt 1997a).

The limited evidence identified through the testing program led Umwelt (1997a) to classify sites KS9 and KS10 as being of low archaeological significance. Section 90 Consent was recommended and issued by DECCW in May 1997. Development works have subsequently been completed in the vicinity of these site locations for the industrial subdivision.

Another program of sub-surface investigation was undertaken by Umwelt (1998a) at sites KS1, KS4 and KS6 for the second stage of the industrial subdivision. The program involved the same research questions and methodology as for the testing of sites KS9 and KS10.

Four transects (total of 44 units) were excavated at site KS6 parallel to the 'unnamed tributary 1', for a total surface area of 11 m^2 and volume of 1.83 m^3. Three transects (total of 30 units) were excavated at site KS4 on either side of and parallel to 'unnamed tributary 1', for a total surface area of 7.5 m^2 and volume of 2.25 m^3 (reported as 0.45 m^3 by Umwelt). One transect (total of 11 units) was excavated at site KS1 on the plain, for a total surface area of 2.75 m^2 and volume of 0.73 m^3. Excavation of the A unit soil typically terminated at the base of the unit at depths of around 0.18 metres at site KS6, 0.23 metres at KS1 and a maximum of 0.56 metres at KS4 (Umwelt 1998a).

A total of 370 artefacts were recovered from site KS6, with artefacts present in almost every test unit. Artefact densities ranged from 17 to 2,320/m^3, with a relatively high mean of 199.5 artefacts/m^3 (33/conflated m^2). Tuff was the dominant stone material (53%), with a high frequency of silcrete (39%) and minor frequencies of 'fine-grained siliceous' stone, quartzite, sedimentary and quartz. Flaked pieces were the dominant lithic type (56%) and flakes (35%) were also common, with minor frequencies of flake portions, retouched flakes (2.7%), cores and retouched flake portions. The majority of artefacts were located in Transect A, the closest to 'unnamed tributary 1' (Umwelt 1998a).

A total of 88 artefacts were recovered from site KS4, with artefacts present in more than half of the test units. Artefact densities ranged from 8 to 500/m^3, with a mean of 39 artefacts/m^3 (11.7/conflated m^2). Silcrete was the dominant stone material (66%), with tuff (27%) and minor frequencies of quartz, quartzite and sedimentary. Flaked pieces and flakes were the co-dominant lithic types (44% each), with minor frequencies of flake portions, cores and retouched flakes. The majority of artefacts were located in Transect B, the closest to 'unnamed tributary 1' (Umwelt 1998a).

No evidence was located in the test units at site KS1 (Umwelt 1998a).

In total, 458 artefacts were located in the 21.25 m^2 of excavations (4.81 m^3). However, the majority of these items are nondescript 'flaked pieces'. In a supplementary report, Umwelt (1998b) concluded that evidence is distributed intermittently along Stony Creek and its tributaries, but not necessarily continuously. The nature of activities represented by the evidence could not be determined (Umwelt 1998b).

Umwelt (1998a) reassessed site KS6 as being of moderate to high archaeological significance, site KS4 of moderate archaeological significance and site KS1 of low archaeological significance. Umwelt (1998a, 1998b) recommended that portions of sites KS4 and KS6 be conserved along with a sample of 'unnamed tributary 1' with the remaining evidence subject to Section 90 Consent.

South East Archaeology was commissioned in May 2003 by GHD to undertake an Aboriginal heritage assessment of a 95 hectare property encompassing the former Westside Golf Course at Rutherford. Heritage Green Residential Golf Course Pty Ltd, part of the McCloy Group, had purchased the former Westside Golf Course and adjacent land and proposes to develop the 'Heritage Green Residential Golf Course'. The present investigation area traverses the Heritage Green study area of Kuskie (2004c) for 1.25 kilometres along the northern side of the railway.

A field survey was undertaken by South East Archaeology and representatives of the local Aboriginal community in July 2003. The Heritage Green study area was subdivided and inspected within 24 environmentally discrete survey areas. Another 21 or more areas, comprising golf course fairways, greens, tees, water bodies, clubhouse and parking area were assessed as having negligible potential for heritage evidence due to the very high levels of ground disturbance. These areas were classified as 'modified' and not subject to direct survey. The total survey coverage equated to approximately 25% of the study area (excluding the 'modified' ground which equates to about 21% of the overall 95 hectare property). The total effective survey coverage equated to around 0.84% of the study area (excluding modified ground) (Kuskie 2004c).

A total of 27 Aboriginal heritage sites, all stone artefact occurrences, were recorded within Heritage Green (each labelled after the Heritage Green initials and the survey area in which they were located). Four of these sites occur within or immediately adjacent to the present investigation area (refer to Appendices 1 and 3 and Section 6):

- Heritage Green 17/C (#38-4-719) - two artefacts, a silcrete flake portion and a tuff microblade core, situated on the southern boundary of the study area adjacent to the fence bordering the Main Northern Railway and immediately south of the 13th fairway;
- Heritage Green 17/D (#38-4-722) - two artefacts, a tuff flake and a tuff core, situated on spoil mounds associated with a gas pipeline on the southern boundary of the study area bordering the Main Northern Railway and immediately south of the 13th fairway;

- Heritage Green 21/B (#38-4-732) - an isolated artefact, a silcrete core, located within a small exposure on the eastern side of the drainage depression, on the rough between mown sections of the 15th fairway; and

- Heritage Green 24/A (#38-4-714) - an isolated artefact, a tuff flake, located on a vehicle track on the southern side of Stony Creek north of the Main Northern Railway.

A total of 116 lithic items were recorded by Kuskie (2004c). These items were dominated by silcrete (64% of the assemblage), with a lower frequency of volcanic tuff (36%). Both materials were procured from sources outside of Heritage Green. The lithic items mainly consisted of artefacts representing non-specific stone knapping or discard, including flakes (44% of the artefact assemblage), flake portions (29%) and cores (16%). Minor frequencies of items representing microblade production/discard and non-microlith tools were identified. The evidence was almost entirely located within 100 metres of Stony Creek and its tributaries.

Kuskie (2004c) categorised the Heritage Green study area into two portions:

A) The highly impacted portion comprising survey areas HG 1-5 and 11-22, encompassing the existing golf course and land to the north-west adjoining the industrial estate. These areas typically exhibited a very shallow A unit soil and high levels of ground disturbance, rendering the potential for sub-surface deposits, particularly deposits that may be *in situ* and/or of research value, very low; and

B) The undeveloped south-eastern portion fringing the Rutherford residential zone, comprising survey areas HG 6-10 and 24, and the Stony Creek corridor (HG23), where levels of ground disturbance were typically moderate. There remains a high potential for further heritage evidence to occur in the form of artefact deposits, potentially including deposits of sufficient integrity to be of research value, particularly in survey areas HG6, HG8 and HG23.

Twenty-four of the 27 Aboriginal sites were assessed as being of low archaeological significance within a local context, primarily on the basis of the limited range and common nature of the site contents, absence of representative value, high levels of ground disturbance and/or the limited potential for sub-surface deposits of research value (Kuskie 2004c). Three sites, HG6/A and HG8/A in the eastern, undeveloped portion of Heritage Green, and HG23/F along Stony Creek, were assessed as being of potentially moderate archaeological significance within a local context. Kuskie (2004c) concluded that there is a high potential for sub-surface deposits of artefacts, potentially including *in situ* deposits, to occur in the A unit soil across these sites and the broader survey areas, particularly within 100 metres of Stony Creek. Further archaeological investigation of these potential deposits could address locally important questions regarding logistical and settlement patterns, stone artefact manufacturing technology and the organisation of stone production and distribution (Kuskie 2004c).

The primary recommendations of Kuskie (2004c) arising from the Heritage Green assessment were that:

- The proposal to establish a heritage conservation zone encompassing portions of Stony Creek and the adjacent simple slopes and spur crest (part of survey areas HG6, HG7, HG8 and HG23) would act to substantially offset the impacts of the Heritage Green development on Aboriginal heritage; and

- Subject to the establishment of a Conservation Zone, the proponent should obtain a Section 90 Consent for the remainder of the development area, inclusive of all identified Aboriginal heritage evidence within this area, in consultation with the local Aboriginal community.

Indigenous Outcomes (2006) conducted a small program of test excavations at Heritage Green in June 2005, at sites HG 6/A, 7/A, 8/A and 21/A. Fieldwork was undertaken with the participation of representatives of the Mindaribba LALC, Lower Wonnarua Tribal Consultancy and Lower Hunter Wonnarua Council. Surface artefacts were also collected from these sites. Indigenous Outcomes (2006) excavated 19 small "shovel pits" of typically a "spade width by spade length", but in some cases extended to unspecified areas, at site HG21/A (DECCW #38-4-834).

Only six artefacts were recovered in this small test excavation sample (reported to be 1.69 m^3 excavated). Similarly, 21 small "shovel pits" were excavated at site HG7/A (#38-4-745) (with three artefacts recovered from the reported sample of 1.02 m^3 excavated), along with 21 small "shovel pits" at site HG6/A (#38-4-747) (two artefacts recovered in the reported sample of just 0.38 m^3 excavated). Nine artefacts were recovered from 22 "shovel pits" at site HG8/A (#38-4-744), from a reported 1.41 m^3 excavated. The small nature of the test excavation sample did not provide sufficient data to permit reassessment of the nature or significance of these sites.

South East Archaeology undertook an assessment of Hunter Water Corporation's (HWC) Maitland No. 14 Wastewater Upgrade Stage 1, at Rutherford. A preliminary desktop assessment was completed (Kuskie 2006) prior to a detailed investigation (Kuskie 2007). The upgrade involves the duplication of approximately 2.3 kilometres of gravity main with a new sewer pipeline of varying diameter. Six previously recorded Aboriginal heritage sites (KS2, KS3, KS4, KS5, KS6 and HG23/E) were identified within the zone of impact of the Maitland No. 14 Upgrade. Five of the sites (KS2-KS6), along with potential sub-surface deposits of research value, occur along an 'unnamed tributary 1', within an area that had been set aside as a conservation zone for the protection of Aboriginal heritage and to offset the impacts of development within an adjacent industrial estate.

Section 90 Consent with Salvage #2807 was obtained in November 2007 by HWC for the proposed impact zone of the Maitland No. 14 Wastewater Upgrade, encompassing the relevant portions of the Aboriginal sites KS2-KS6 and HG23/E (DECCW #38-4-740), including the route through the drainage depression east of the Rutherford Industrial Estate and Shipley Drive south to Racecourse Road. The route terminates about 300 metres north of the present investigation area.

South East Archaeology was engaged by HWC to undertake the archaeological salvage required under AHIP #2807. The principal tasks of this salvage investigation were to undertake the surface collections of sites KS2, KS3, KS4, KS5, KS6 and HG23/E, systematic exposure of the sewer trench along the 'unnamed tributary 1', and localised hand excavation of any features of significance that were identified. The salvage was conducted over nine days in February and March 2008 by archaeologists from South East Archaeology, assisted by representatives of the Mindaribba LALC (Kuskie 2008b).

An excavator was used to systematically expose the sewer trench along the 'unnamed tributary 1' east of Shipley Drive. A total of approximately 381 metres in length by 1.7 metres width (648 m^2) was systematically excavated, resulting in the identification and collection of 119 stone artefacts. Two features of potential significance (artefact clusters) were identified during the systematic archaeological exposure of the trench, along the 'unnamed tributary 1', and subject to hand excavation. An area of 4.95 m^2 (2.75 x 1.8 metres) was excavated at HE@346 to retrieve the feature, along the narrow zone of impact of the proposed sewer trench. A total of 342 stone artefacts was recovered and these occurred at a mean density of 69.1 per conflated square metre or 310.9 per cubic metre of deposit. An area of 3.4 m^2 (2 x 1.7 metres) was excavated to retrieve a second feature, HE@258. A total of 115 stone artefacts was recovered and these occurred at a mean density of 33.8 per conflated square metre or 217 per cubic metre of deposit (Kuskie 2008b).

A charcoal stained depression, inferred to represent an Aboriginal fireplace, was identified in HE@346 and a sample of charcoal retrieved for radiocarbon dating. The charcoal was dated to 2,838±39 years BP (*Wk23298*), which equates to an age calibrated to two standard deviations (95.4% probability) of 3,000 - 2,770 calBP (1,050 - 820 BC) (Kuskie 2008b).

The primary results to arise from the investigation (Kuskie 2008b) include:

- The evidence from HE@346 is significant as it is the oldest identified evidence of Aboriginal occupation now known in the Rutherford locality, demonstrates Aboriginal use of the lowest margins of the slopes, virtually in the basin of the drainage depression, and highlights the survival of Aboriginal evidence despite high levels of recent human impacts in the surrounding area. The salvage results confirm the heritage potential of such contexts in the lower Hunter area. This finding has implications for the management of heritage resources in the region and highlights the fact that controlled excavation is an essential tool in enabling the issue of integrity of deposits to be addressed;

- For much of the narrow study area, the evidence represents hunting/gathering without camping, undertaken in multiple episodes each of short duration and probably infrequently over time by low numbers of people. Backed artefacts were discarded, probably away from their location of manufacture. Food processing and/or equipment maintenance tasks may have been undertaken, as inferred by the presence of a low number of utilised artefacts. Focused activity occurred in several discrete activity areas, both inferred to represent locations where predominantly heat treated silcrete was knapped and backed artefacts produced; and

- The overall spatial distribution and nature of evidence is anticipated to have comprised a low density distribution of artefacts consistent with background discard, interspersed by a number of discrete activity areas in which more focused activity occurred.

In other studies conducted within the Rutherford area, Brayshaw (1997) investigated a proposed concrete batching plant at Lot 111 DP 854273. Lot 111 is located within the Rutherford Industrial Area and borders the New England Highway, about 1.8 kilometres north of the present investigation area. No Aboriginal heritage evidence was identified within the 0.63 hectare area.

Nearby, ERM (2002) investigated a 400 x 90 metre area for a proposed truck stop at the junction of the New England Highway and Kyle Street, Rutherford, a similar distance from the present investigation area. No evidence was identified in the poorly drained land.

Further south of the investigation area toward Kurri Kurri, surveys have been undertaken by Djekic (1984) and others which have primarily resulted in the detection of artefact scatter sites and to a lesser extent, grinding grooves. The artefact assemblages are described as predominantly containing tuff and silcrete items. Djekic (1984) surveyed the route of the Kurri-Kurri to Alcan 132 kV transmission line, several kilometres from Wentworth Swamp. The route traverses flat to gently undulating terrain with numerous intermittent watercourses, several creeks and a swamp. The four kilometre route was inspected on foot and despite low visibility, one isolated artefact and four artefact scatters were located. These were sub-surface deposits exposed by erosion or ground disturbance, all adjacent to a watercourse. Many areas were assessed as being of high archaeological potential.

Near the eastern end of the present investigation area at Telarah, Umwelt (Australia) Pty Ltd (1997b) surveyed a small area for a proposed rezoning. No Aboriginal heritage evidence was identified.

South East Archaeology investigated the Bunnings Warehouse site 0.8 kilometres north of the eastern end of the present investigation area at Johnson Street, Telarah, following the identification of stone artefacts during construction work. Two sites were recorded, Johnson Street 1 (#38-4-707) and Johnson Street 2 (#38-4-708) and a Section 90 Consent subsequently obtained. Site Johnson Street 1 comprised at least nine artefacts exposed on excavated soil associated with the clearing and levelling of the south-western portion of the development area. Site Johnson Street 2 comprised a single tuff artefact exposed on excavated soil associated with the construction of a wetland conservation zone in the northern portion of the development area.

Stuart (HLA Envirosciences Pty Ltd 1999) surveyed an eight kilometre pipeline route from Bolwarra to the Wentworth Swamps Waste Treatment Works at Farley, locating one isolated find at Bolwarra. Low conditions of surface visibility constrained the survey.

F3 Freeway to Branxton:

Extensive investigations have been undertaken of the proposed F3 to Branxton highway connection, a dual carriageway route of approximately 40 kilometres from the F3 at Seahampton to the New England Highway at the Belford Deviation west of Branxton. The route primarily traverses to the south of the present investigation area, crossing it near Branxton. The western end of the F3 to Branxton alignment is therefore located to the north of the present investigation area.

An initial survey of the F3 to Branxton alignment was conducted by Brayshaw (1994) and subsequent surveys, test excavations and salvage collections and excavations were undertaken by Brayshaw (2001) and Umwelt (2003b, 2004, 2005, 2006a, 2006b). Numerous stone artefact sites have been identified, along with grinding grooves and stone arrangements.

Surveys of the F3 to Branxton route alignment were undertaken in December 2003 and February 2004 for 'Section 1', the eastern-most four kilometres of the route near Seahampton, and from January to March 2004 for 'Section 2', which comprises the route west of Seahampton to the Belford Deviation west of Branxton. The Aboriginal organisations involved in the assessment of 'Section 2' included the Mindaribba LALC, Wonnarua Nation, Lower Wonnarua Tribal Consultancy, Barkuma Neighbourhood Centre and Black Creek Aboriginal Corporation. The sites recorded included 50 artefact scatters, 29 isolated artefacts, eight grinding grooves and three stone arrangements (recorded as a single site complex), along with 22 PADs.

Sub-surface investigation of a number of sites and PADs was undertaken by Umwelt (2006a) between July 2004 and October 2005, under Section 87 Permit #2096. This involved at least four sites of potential significance (#37-6-1339, 37-6-1368, 38-4-813 and 38-4-815) and 19 PADs. The test excavations typically comprised four single square metre units excavated on a 10 metre grid at each PAD or site. In addition, nine landform units were tested across nine different creek catchments. This typically involved excavation of square metre units at 50 metre intervals from the creek banks to adjacent crests. Hence, variable numbers of test units were excavated between the different locations. Approximately 1,560 artefacts were recovered from the overall testing program, but detailed results are pending.

Salvage by surface collection and/or excavation was undertaken under Section 90 Consent #1940 for five sites in the Blue Gum Creek catchment in 'Section 1', with nine test units also excavated near that creek.

Salvage by surface collection was undertaken under Section 90 Consent #2102 for 68 sites within 'Section 2'. Preliminary results have been presented by Umwelt (2006a), but a detailed report is pending.

Salvage of both surface artefacts and sub-surface deposits is yet to occur for a number of sites/PADs that may be impacted by the proposal. A final report on the collections and excavations undertaken to date is pending.

Six of the F3 sites are located within or in close proximity to the current investigation area at Branxton (refer to Appendices 1 and 3 and Section 6):

- #37-6-1315 (Anvil Creek RTA 13 IF): Initially recorded by Umwelt as an isolated artefact in 2004. The site was collected by Umwelt (2006a) under Section 90 Consent #2102, with one artefact retrieved;
- #37-6-1324 (Anvil Creek RTA 22): Initially recorded by Umwelt in 2004 as a scatter of two artefacts. The site was collected by Umwelt (2006a) under Section 90 Consent #2102, with three artefacts retrieved;
- #37-6-1339 (Black Creek RTA 2): Initially recorded by Umwelt in 2004 as a scatter of over 50 artefacts on the second terrace of Black Creek, exposed in a road drain. The site was subject to test excavation by Umwelt (2006a) under Section 87 Permit #2096. A total of 240 artefacts were retrieved, many at depths of between 0.75 and 1.15 metres below the surface. Umwelt (2006b) proposed broad-area salvage excavation of a sample of the site;
- #37-6-1340 (Black Creek RTA 3): Initially recorded by Umwelt in 2004 as a scatter of three artefacts. The site was collected by Umwelt (2006a) under Section 90 Consent #2102, with three artefacts retrieved;
- #37-6-1370 (Anvil Creek RTA 29, formerly PAD 18 Anvil Creek): This PAD was identified on the footslope on the western side of a tributary of Anvil Creek by Umwelt (2004). The PAD was subject to test excavation by Umwelt (2006a) under Section 87 Permit #2096. A total of 16 artefacts were recovered; and
- #37-6-1371 (PAD 20 Black Creek): This PAD was identified on the first, second and third terraces on the western side of Black Creek by Umwelt (2004). The PAD was subject to test excavation by Umwelt (2006a) under Section 87 Permit #2096. Three artefacts were recovered and Umwelt (2006a) proposed to merge the site with #37-6-1370.

3.2.1 Synthesis

Numerous surveys have been undertaken within the Central Lowlands, often in relation to development proposals. Typically these surveys have:

- Involved a wide range of study area sizes, which are often very small but also include many relatively large areas (for example 3,600 hectares at Mount Arthur North, Kuskie 2000); and
- Resulted in the location of numerous artefact occurrences, primarily only when exposed by erosion or other forms of ground disturbance (for example 1,188 spatially separate loci of artefact evidence at Mount Arthur North, Kuskie 2000).

Artefact scatters in the region are typically dominated by two stone materials, tuff and silcrete, and it appears that dominance is generally related to the local availability, abundance and quality of these materials. Preferences of stone materials for manufacturing of backed artefacts appears to be equally variable and dependant on availability and quality of materials (Kuskie and Clarke 2006a).

Artefact occurrences tend mostly to be identified near watercourses, particularly on level or gently inclined landform units and close to higher order streams. Fewer instances are reported of artefacts along ridgelines. However, the majority of surveys have obtained a disproportionate sample of watercourses in relation to other environmental contexts. Virtually no evidence has been identified along recent alluvial flats (Kuskie and Clarke 2006a).

Individual open sites can range in artefact quantity from one to many hundreds or even thousands of artefacts. Typically many exposures of evidence contain fewer than ten artefacts. Artefact density in the surface assemblages varies, but is generally low (less than one artefact per square metre). Where sub-surface testing or salvage excavation has been undertaken, it has often resulted in the location of artefacts within the upper (A horizon or unit) soil. These deposits can include dense concentrations of artefacts, along with other features such as hearths and heat-treatment pits (Kuskie and Clarke 2004, 2006a).

Flakes, flaked pieces and cores relating to general stone flaking and the production of microblades are items typically found in open artefact scatters. Artefacts that have been retouched or utilised typically comprise less than 5% of overall assemblages. Often bondi points (spear barbs) or other microliths comprise much of the retouched/utilised category. Tools relating to other activities also comprise a very small proportion of most assemblages (Kuskie and Clarke 2006a).

Three basic patterns of site structure have been identified:

- Low density 'background discard';
- Isolated knapping floors/artefact concentrations, with minimal other evidence apart from 'background discard'; and
- Denser concentrations of artefacts extending over large areas, but without distinct knapping floors or clear spatial structure (*cf*. Koettig and Hughes 1985:48).

Other site types have been recorded in the Hunter Valley, including grinding grooves, middens, bora and ceremonial sites, burials, scarred trees, stone arrangements, rock shelters with art, fish traps and places of contemporary or traditional Aboriginal significance. These provide evidence of the diverse range of Aboriginal behaviour reflected in the heritage resource, including subsistence, technology, material culture, spiritual practices and social behaviour.

Key research themes involved in archaeological analyses of the Hunter Valley have arisen from the large quantity of Environmental Impact Assessment driven work, particularly within the Central Lowlands region. These include (*cf*. Kuskie and Clarke 2004, 2006a):

- Analysis of stone working technology by technical attributes, conjoining and discard events;
- Spatial patterning of artefact distributions and arrangement of activity areas;
- Heat treatment;

- Age of occupation;
- Models of occupation;
- Artefact and site functions, including use-wear and residue analysis;
- Methodological issues; and
- Site integrity and post-depositional disturbance.

Aboriginal occupation within the Central Lowlands of the Hunter Valley commenced at least 20,000 years ago. Koettig (1987) obtained a date of >20,200 years BP from a hearth at Glennies Creek, 35 kilometres north of Branxton. Kuskie (in prep.) identified at least one site of Pleistocene age, WB1 (#37-6-402) at the South Lemington mine near Singleton, on the basis of geomorphological evidence. In surrounding regions, Aboriginal occupation has been dated to at least 19,000 years ago on the Liverpool Plains (Gorecki *et al* 1984), 11,000 years ago in the upper Mangrove Creek catchment of the Hawkesbury River (Attenbrow 1987) and 17,000 years ago at Moffats Swamp near Raymond Terrace (Baker 1994). However, the majority of dated archaeological sites in the Hunter Valley are less than 4,000 years of age (Brayshaw 1994:15, Kuskie and Clarke 2004).

3.3 Local Aboriginal Culture

Traditional Aboriginal culture in south-eastern Australia was complex and varied. The present state of knowledge is based partially on studies of contemporary Aboriginal communities in northern and central Australia and on observations of the south-eastern communities after the immense disruption caused by non-indigenous settlement (Thompson 1985). Consequently the nature of organisation of Aboriginal groups within the Hunter Valley is unclear. Earlier observers used the term ‘tribe’ to refer to anything from 10 to 500 people. Aboriginal people themselves used a variety of names which might have referred to dialects, territories of other groups, local bands or regional networks (Brayshaw 1986).

Tindale (1974) compiled an assessment of Aboriginal territories in Australia. The Wonnarua people are described as occupying the Hunter region from just west of Maitland to the Great Divide, south to the Darkinjung's territory on the divide north of Wollombi, and north to Muswellbrook (Tindale 1974). This zone encompasses the present investigation area. The Awabakal territory lay immediately to the south-east, extending south from the Hunter River to Norah Head and Wyong, and west to Kurri Kurri and Maitland (Tindale 1974). The Worimi people occupied a territory north from the Hunter River between Maitland and Stockton, north to Forster and inland to near Gresford and Glendon Brook, Dungog (Tindale 1974).

A variety of subsistence resources would have been available to the local Aboriginal population from the forest and wetlands. Several ethnohistorical observations have been recorded of the use of plants and animals in the region. While these observations have tended to focus on visible activities, they have often omitted details of less visible (and predominantly female) plant gathering activities (Brayshaw 1986).

Brayshaw (1986) examined the ethnohistorical observations of early settlers and explorers in the Hunter Valley. Foods exploited would have included kangaroos, wallabies, echidna, emu, possum, flying fox, birds, wildfowl, goanna, snakes, yam, fern root, berries, native orange, cabbage palm heart and wild honey. Ethnohistorical evidence is available to suggest that Aboriginal people regularly and systematically modified the landscape through the use of fire.

Special mention is made in the ethnohistorical literature about the dependence of estuarine dwelling Aboriginal people on 'fern roots', which is presumably bracken fern (*Pteridum esculentum*) but possibly also bulbs and roots of swamp and marsh plants (Moore 1981). Barrallier (1802:81-83 in Brayshaw 1986) witnessed a young Aboriginal looking for the roots of 'Fern' in June 1801. Threlkeld (in Gunson 1974:55) observed people eating the fern root which 'they roast, and beat it with a stone upon a larger one, when they use it for bread'. Brayshaw (1986) considers this fern may have been *Blechnum* spp. (swamp fern). Ebsworth (1826:71 in Brayshaw 1986) also documents its consumption at Dungog, where it was known as 'bungwall'. Bracken fern has thin, starchy rhizomes which are edible from late summer to autumn (Isaacs 1987:105). The rhizomes are sometimes pounded to extract the starch, which is cooked in cakes, as the rhizomes alone are very fibrous (Isaacs 1987:105).

No references are made to seeds of kangaroo grass (*Themeda australis*) being ground, although their occurrence is widespread in the valley (Brayshaw 1986). The seeds are normally ground and baked, and are available from December to March (Isaacs 1987:229).

The material culture of the local people would have included a variety of items made from bark, other components of plants, stone, shell, bone or other animal components (for example, fur), including shields, clubs, spears, digging sticks, boomerangs, water containers, message sticks, clapping sticks, spearthrowers, bark and vine cords, huts, netted and woven dilly bags, bone tools, stone tools, fur belts and fur cloaks (*cf* Brayshaw 1986). Ethnohistorical observations are documented within the Hunter Valley for the use of bark for huts, string, baskets and drinking vessels, and in cord for sewing canoes, fishing lines and nets (Brayshaw 1986). Kangaroo bones were made into awls to sew kangaroo and possum skin cloaks, belts and headbands (Brayshaw 1986).

While many items were made from wood, preservation conditions are generally limited so that evidence of these in an archaeological context is rare. Stone, bone and shell implements are common in archaeological sites. However, very few ethnohistorical references have been made to these materials.

Threlkeld (in Gunson 1974:67) mentions the use of quartz flakes, and later broken glass, to form serrated edges along fighting spears. Barrallier (1802:81 in Brayshaw 1986) also noted fighting spears with 'pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw'. Stone hatchets were observed by Threlkeld (1834, in Gunson 1974) and Dawson (1830). The stone was mainly basalt or diorite and ground at the edge.

However, apart from quartz spear barbs and stone hatchets, no mention is made in the ethnohistorical literature of other types of stone artefacts. None of the ethnohistorical accounts explain the profusion of Bondi points within archaeological sites, nor do they identify the large core and flake component as having been used within the historical period (Brayshaw 1986:68). Brayshaw (1986) suggests that this may be due to these items having escaped the attention of observers, or that they were not in use at the time of contact, having been replaced by shell, wood or bone. Dean-Jones (1990:68) suggests that it was because most observations were made from a distance and the stone tools were too small to be seen. For whatever reason, the manufacture or use of stone artefacts, which make up the majority of evidence in archaeological sites, is scantly documented.

The arrival of non-indigenous people had disastrous effects for the local Aborigines. The observations of early settlers give pertinent insights into the main causes of this event.

The rapid spread of European diseases, which the Aboriginal population had not hitherto been exposed to or developed immunity to, was a major factor. Smallpox, typhoid, influenza, scarlet fever, measles, diphtheria, whooping cough and croup contributed to the deaths of many Aboriginal people (Wood 1972). Major smallpox epidemics occurred between April and May 1789 and again from 1829 to 1831 (Butlin 1983). The first epidemic was reported to have decimated half of the Aboriginal population between Botany Bay and the Hawkesbury (Butlin 1983). E. M. McKinlay of Dungog and Joseph Docker of Scone stated that an epidemic of smallpox swept through the Aboriginal population in the upper Hunter in 1835 (Miller 1985).

Reverend Threlkeld noted in 1828 the effects of influenza and in 1837 the effects of measles, hooping cough and influenza (Turner and Blyton 1995). In a reply by various Ministers of the Church of England in the lower Hunter Valley, to a circular issued in 1846 by the NSW Select Committee on the Condition of the Aborigines requesting information on the state of the local Aborigines, responses highlighted the effects of diseases and a rapid recent decrease in the Aboriginal population. Reverend C. P. N. Wilton, Minister of the Church of England in Newcastle, reported smallpox and measles to be factors in the rapid decrease in the local population (by half in the previous ten years) (Wilton in NSW Legislative Council 1846). Reverend George Augustus Middleton, Minister of the Church of England at Morpeth, partially attributed the population decline to native pock and influenza (Middleton in NSW Legislative Council 1846).

Factors other than disease contributed to the rapid decimation of the Aboriginal population and traditional life, including the loss of traditional hunting grounds and a decrease in abundance of the game that populated them. Again, the Church of England Ministers highlighted this factor. Reverend Wilton observed that the ordinary means of subsistence for the Aboriginal people was greatly diminished: 'Emu, kangaroo, wallibi and opossum almost disappeared from their hunting grounds', fish and 'Kon-je-voi' were the only abundant foods left' (Wilton in NSW Legislative Council 1846). Reverend Middleton also observed that the ordinary means of subsistence were seriously diminished, due to clearance of brushes and draining of lagoons. No kangaroos were present, but rivers, lagoons and forests continued to supply some food (Middleton in NSW Legislative Council 1846).

Turner and Blyton (1995) argue that violence by non-Aboriginal men against Aboriginal women was a major cause of the decline in population. To an extent this may hold true for the Hunter region, however the rapid decrease in hunting grounds (as non-Aboriginal settlers developed pastures, villages and mines) and a reduction in the abundance of food sources as native animal and plant habitats were destroyed, is evidenced by ethnohistorical accounts as to its negative effects on the Aboriginal population. Also, Miller (1985) reports that the Wonnarua were possibly the first Aboriginal group to allow the children of mixed parentage to live, a factor that contributed to their survival.

The rapid deaths of many Aboriginal people through disease also acted to destroy the complex structure of their traditional society. Systems of kinship, marriage, order and subsistence were thrown into disarray.

Wood (1972) reports that a non-indigenous settler at Patrick's Plains (Singleton) counted 300 healthy Aboriginal men in the district in 1824. Twenty years later, less than three dozen could be found by the non-indigenous settlers, and they no longer camped in the bush but lived on the properties of settlers who would allow them (Wood 1972). In the returns of Aborigines from selected blanket distributions, the following populations were recorded at Singleton (Brayshaw 1986:58):

- In 1834, 34 adult males, 24 adult females, 12 male children and four female children;
- In 1838, 51 adult males, 13 adult females and no children; and
- In 1843 (also including Wollombi), 43 adult males, seven adult females, six male children and one female child.

Similarly in the lower Hunter, in a reply to the circular issued by the NSW Select Committee on the Condition of the Aborigines (NSW Legislative Council 1846) the following populations were also documented:

- Newcastle in 1846: 20 adult males, five adult females, two male children and two female children (Rev. Wilton);
- Morpeth in 1846: 15 adult males, five adult females and three male children (Rev. Middleton); and
- Paterson in 1846: 20-30 people, including seven or eight children (Rev. Smith).

A dramatic decline in Aboriginal numbers over the preceding ten year period was noted by Reverends Wilton, Middleton and Smith (NSW Legislative Council 1846).

Although a number of initial encounters between the non-indigenous people and Wonnarua were relatively friendly (*cf*. Needham 1981, NSW Legislative Council 1846), serious conflict quickly arose over the mis-treatment of Aboriginal women by the settlers. Misunderstandings with pastoral settlers also became more common. Convicts were often brutal to the Aboriginal people (Dawson 1830, Gunson 1974:4-5). The behaviour of timber getters in cutting down trees (believed to house the souls of Aboriginals awaiting rebirth) and shooting fauna (totem animals to the local Aboriginals) were also causes of conflict (Needham 1981).

Wonnarua people organised violent resistance against the white settlers/invaders (Miller 1985). From the 1830s groups of Aboriginal people raided settlers' properties and stole food and attacked people. Many offenders were captured and tried before the Supreme Court in Sydney. Some were acquitted and others were sentenced to death (Turner and Blyton 1995). Settlers conducted various atrocities against the Aboriginal people. For instance, in March 1827, shepherds murdered 12 Wonnarua people along the Hunter River (Miller 1985:41).

By the 1840s, many of the remaining local Aborigines were dependent upon the settlers for old clothing, money and rations (Wilton in NSW Legislative Council 1846). Aboriginal people were employed by settlers as hewers of wood, drawers of water (Backhouse 1843:389), about the house, to run errands, or on farms to gather maize or burn off (NSW Legislative Council 1846). The annual distribution of blankets conducted by the Government was ended in 1844, to the anger of the local Aborigines who could no longer obtain traditional possum skin cloaks due to the reduction in animal numbers and possible loss of knowledge and trading networks.

The destruction of their traditional society and the increasing reliance on the settlers led many Aboriginals into a life of alcohol dependence. Increased hostility among Aboriginal people resulted from these pressures on their society, the integration of groups which historically had hostile relationships, and the effects of alcohol (Hartley 1995, *Hunter Valley Gazette* 18 December 1841, *Maitland Mercury* 1 April 1843).

In the latter part of the 1800s there was growing concern in NSW about the plight of the Aboriginal people. The Aborigines Protection Association was formed and in 1881 a Protector of Aboriginals appointed. In 1883 the Government established a Board for the Protection of Aborigines to achieve a "more systematic and enlightened treatment of Aborigines". Rural stations were created so that Aborigines could remain on tribal territory. One such station was established at St. Clair (now "Mount Olive Station"), 20 kilometres north of Singleton. However, the Protection Board became one of the organisations most feared by the Wonnarua people, who were systematically oppressed by its actions (*cf.* Miller 1985).

By the 1940s people moved to the urban areas to escape the oppression of the Aboriginal Protection Board and to find employment. Singleton became one of the main centres for Aboriginal people in the central Hunter Valley. Thousands of Aboriginal children in NSW were removed from their families between 1909 and 1967 and placed in institutions. Aboriginal people outside of the missions lived in shanty settlements on the fringes of non-indigenous communities or in tent villages alongside railway lines (Turner and Blyton 1995).

However, a large and vibrant Aboriginal population remains in the region today, particularly focused on urban areas such as Singleton, Cessnock and Maitland, and takes an active interest in their heritage. Consultation with the local Aboriginal community has formed an integral part of the assessment (refer to Section 5.2) and is essential to identify certain site types and cultural values.

Figure 3.1: Cultural group boundaries in the Hunter region (Tindale 1974 above and Horton 2000 below).

3.4 Model of Aboriginal Occupation

Broader models of occupation for the Hunter Valley region have been proposed by Kuskie and Kamminga (2000) for the lower valley and Kuskie and Clarke (2004) for the central to upper valley, based on ethnographic, ethnohistorical, oral historical and archaeological evidence. These models have been refined through subsequent excavations and analysis (Kuskie 2009c, Kuskie and Clarke 2006a, 2006b, Kuskie and Ingram 2008). Elements of the regional models that are of particular relevance to the investigation area include:

- Occupation predominantly focused on the relatively more abundant and diverse resource rich zones within the tribal territory (for example, the junction of multiple resource zones) particularly along the Hunter River and its former estuarine margins and around wetlands, swamps and lakes. Within the *primary resource zones*, such occupation could include nuclear/extended family base camps, community base camps and occasional larger congregations of groups where resources permitted. Encampments in more favourable locations (for example, abundant resources and water) may have been the subject of stays of longer duration and more frequent episodes of occupation than in other areas (for example, secondary resource zones, refer below);

- Outside of the primary resource zones sporadic occupation of *secondary resource zones*, focused on the watercourses, particularly within close proximity (for example, 50 metres) of higher order watercourses and associated level to very gently inclined valley flats (for example, Black Creek). These zones were utilised for encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round. There was a strong preference for camping on level ground, adjacent to reliable water sources and more abundant subsistence resources. A greater range and frequency of activities were undertaken at the encampments, rather than in the surrounding landscape. Camp sites along the watercourses were occupied by these small groups of people for varying lengths of time (but of typically short duration), during both the course of the seasonal round and in different years. Occupation of these camp sites was predominantly sporadic, rather than continuous;

- Not withstanding the points above, widespread, generally low intensity, usage of the entire tribal territory. Occupation outside of the primary resource zones and secondary resource zones tended to involve hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials. However, the utilisation of these areas (for example, simple slopes, ridge crests, spur crests and lower order watercourses) was far less intense than areas such as valley flats and higher order watercourses where encampments were situated and potable water and more abundant resources were present. These areas were probably typically exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones that foraged within an area of up to ten kilometres radius from their campsites;

- Occupation outside of the primary and secondary resource zones also involved special purpose journeys (for example, to procure stone from a known source or to access an area for ceremonial/spiritual purposes) and non-secular activities (for example, ceremonial activities);

- Thus, occupation extended over the entire tribal territory, with varying intensities and involving different activities, and occurring at different times of the year and different periods within the overall time-span of occupation;

- Occupation (or at least the evidence that survives of that occupation) predominantly occurred within the mid to late Holocene (past 5,000 years), after climatic change and rising sea-levels transformed the environment of the region, although sporadic occupation of the Hunter Valley may have extended as far back as 30,000 to 40,000 years;

- Activities such as food procurement (hunting, gathering and land management practices such as burning-off), food processing, food consumption, maintenance of wooden and stone tools, production of stone tools (including systematic production of types such as backed artefacts, as well as hafting of implements and casual, opportunistic production of other items on an as needed basis), production of wooden tools and other implements, procurement of stone, erection of shelters, children's play, ceremonial activity, spiritual activity, human burials and social and political activity are among the types of pursuits engaged in by the local Aboriginal people across the tribal territory;

- Activities varied in frequency and occurrence within the landscape (and between the different occupation site types - refer below), probably in relation to numerous variables such as topography, distance to resource zones, distance to water, aspect, slope and cultural choice. However, few activities are evident within the archaeological record other than those involving the use of stone, or where preservation conditions permit, other materials such as bone, shell and wood. The majority of evidence within an archaeological context will relate to reduction of stone, but some evidence will exist of encampments, food processing, food procurement and ceremonial and other activities;

- The stone materials silcrete and tuff were favoured for stone working activities, with the relatively intensity of use of each material dependent upon the proximity of local sources. Other stone materials such as porcellanite and petrified wood were also preferentially employed for manufacturing small implements such as backed artefacts. Again, selection and use of these materials also related to their relative availability from local sources in various locations within the landscape;

- Stone was typically procured during the course of normal daily and seasonal movements, without the need for special purpose trips. The conservation of the most commonly used stone materials such as silcrete and tuff was not a priority. However, high quality less commonly utilised materials may have been procured from more distant sources by special purpose journeys and/or trade;

- Minimal use was made of other stone materials. Several of those that were utilised (quartz, quartzite, acidic volcanics, chalcedony and chert) were probably obtained from local sources such as alluvial and terrace gravels, terrestrial outcrops and weathered conglomerate rock;

- Heat treatment of silcrete was undertaken to improve flaking qualities and possibly to obtain desired colours. Tuff was not deliberately heat treated. Kuskie and Kamminga (2000) speculate that colours had important symbolic meaning in Aboriginal society, and part of the reason for heat treatment may have been to obtain a desired colour as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears;

- Ochre was used for ceremonial purposes and is likely to have been procured from relatively local sources;

- Backed artefact production occurred widely, with the primary goal of producing microliths (such as Bondi points) that could be hafted onto hunting or fighting spears made of grass tree stems or other wood, with the use of resin. It was more likely to be a planned and organised activity, but it did not necessarily occur only at nuclear family base camps or hunting party camps. Microblade production may also have occurred in places traversed during the course of hunting expeditions, such as resting places along travel corridors. When the production of microblades occurred away from camps, it may have involved more casual or opportunistic behaviour, such as backing a microblade to replace a spear barb when needed;

- Production of backed artefacts was time-consuming and resulted in a considerable quantity of stone debitage at localities where it was undertaken. It is speculated that the end purpose (hunting or fighting spears armed with stone barbs) must have been highly desirable and socially valuable (Kuskie and Kamminga 2000). Hunting larger animals with spears was also a high-risk subsistence activity (in terms of invested time, energy and the price of failure), whereas most dietary requirements could be adequately met through low-risk means (ie. more reliable in terms of time, energy and return). Global scale analyses have demonstrated that in lower latitudes (in which the Hunter Valley is situated), with longer plant-growing seasons, plants and small land fauna are prominent in the economy of hunter-gatherer people *(cf.* Binford 1980, Torrence 1983). The investment of considerable time and energy in the production and hafting of backed artefacts to hunting and fighting spears may well have been undertaken as much in relation to the social value of these items and tasks as strictly utilitarian need (Kuskie and Kamminga 2000);

- Casual and opportunistic reduction of stone or selection of flakes to meet requirements on an 'as needed' basis was a widespread occurrence. Suitable flakes (sometimes after being retouched) were used in domestic tasks such as fashioning or repairing a wooden implement, while a higher proportion of flaked products were simply discarded at the site of their manufacture, without use;

- A low frequency of items was knapped using bipolar technology. This technology is largely, although not entirely, restricted to the reduction of quartz. It is likely that this technology was employed to reduce small pebbles rather than as strategy to prolong the life-use of an existing core;

- Special tools such as worimi cleavers and grindstones were large and heavy and may have been deliberately cached at base camps in readiness for return visits;

- Plant foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. A range of plant resources was available in the locality. Women played a much larger role than men in obtaining and processing plant foods. Macrozamia kernels were collected and prepared by a special process to remove toxins (*cf.* David 1890, Backhouse in Gunson 1974). Ferns may have been a staple of the local diet, along with the bulbs and roots of other wetland plants;

- Animal foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. Men hunted for larger game, while women played a key role in obtaining smaller game. Hunting was a planned and coordinated event. Birds, such as swans and ducks, were caught around the swamps and lakes (*cf.* Threlkeld in Gunson 1974); and

- Fish were obtained by several methods. People used bark canoes on lakes, wetlands and rivers, and angled with shell fish-hooks and line. Fish were also obtained directly by spearing, while standing in a canoe or on a bank, or by the use of hand nets to form a circle in shallow waters and enclose the fish. Another group activity was the planting of sprigs of bushes in streams, with some men frightening the fish towards an opening, at which point others stood ready with nets to catch them (*cf.* Threlkeld in Gunson 1974). Eels were also caught in an organised manner, with small trenches being dug in the swamps, particularly near the narrower outlet (*cf.* David and Etheridge 1890:46). Managing resources by the use of facilities (eg. fish and eel traps) and fire (encourages new grass to attract kangaroos or manage macrozamias) were additional strategies aimed at increasing the reliability and productivity of food resources (Rich 1995:4).

The proposed model of occupation (from Kuskie and Kamminga 2000, Kuskie and Clarke 2004) has been derived from archaeological, ethnographic, ethnohistorical and anthropological information. However, as these data are generally scant and subject to biases and other constraints, the proposed model is highly inferential and speculative in nature and subject to reassessment by more detailed future investigations throughout a wide range of environmental/cultural contexts in the Hunter Valley.

In general terms, the nature of occupation within the locality of the investigation area could represent a variety of circumstances, such as:

- Transitory movement;
- Hunting and/or gathering (without camping);
- Camping by small hunting and/or gathering parties;
- Nuclear/extended family base camp;
- Community base camp;
- Larger congregation of groups; or
- Ceremonial activity.

The evidence could represent a single episode or multiple episodes of one or more of the above types of occupations. The episodes of occupations could have occurred at different times over the entire time-span of occupation in the region. Each episode of occupation could also have been for a different duration of time.

Unless the archaeological evidence for individual activity events is readily identifiable, it can be highly problematic to determine the types of occupation, number of episodes, and times and duration represented by evidence at a particular site. Suitable circumstances are rarely present in open sites, due to mixing of evidence by post-depositional processes and the superimpositioning of evidence caused by repeated episodes of occupation.

Much of the investigation area (specifically, those areas distant from the higher order watercourses or Wentworth Swamps) is located in contexts that do not conform to primary or secondary resource zones. According to the modelling above, occupation of these portions of the investigation area is therefore more likely to have related to hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials, and have been of a generally low intensity.

Portions of the investigation area (specifically, those areas close to the higher order watercourses of Stony Creek, Anvil Creek, Sawyers Creek, Black Creek, Sweetwater Creek and Jump-Up Creek, along with areas at the eastern end close to Wentworth Swamps) are located in what may be characterised as secondary resource zones. Occupation of these areas, in addition to hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials, probably also involved encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round. Occupation of these areas is also likely to have been of a relatively higher intensity than in the remainder of the investigation area.

Listed below is a brief description of the nature of each type of occupation and the material circumstances or evidence that may relate to such occupation types within the present investigation area (*cf*. Kuskie and Kamminga 2000, Kuskie and Clarke 2004):

Transitory movement:

- May occur when an individual or group of people are moving between base camps, or from a campsite to resources or a ceremonial or other special purpose sites.
- Duration would be less than a day and probably less than a few hours.
- Total numbers of people would be relatively small.
- Could occur on most topographical units and classes of slope, but possibly more frequently on ridge and spur crests and along watercourses and valley flats.
- Proximity to potable water was probably not important.
- Proximity to food resources was probably not important.
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play or knapping activity.
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard', unless repeated episodes have occurred causing superimpositioning.

Hunting and/or gathering (without camping):

- May occur when an individual, or more likely a small group of closely related people, engage in hunting activities (more likely to be a party of men) or gathering activities (more likely to be women and children).
- Duration would be less than a day, with people returning to a base to sleep.
- Total numbers of people would be relatively small.
- Would be expected to occur where food resources were available, which for different foods may be a seasonal or annual occurrence.
- Proximity to potable water was probably not important.
- Evidence may represent accidental discard, loss during use, repair of hunting or gathering equipment, children's play or knapping activity.
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard'. Loss or discard of specific tool types may be a useful indicator (particularly items with use-wear/residue that are not in association with evidence of their manufacture or maintenance). Repeated visits to particularly food sources may cause a build up of unrelated evidence over a period of time in a specific location.

Camping by small hunting and/or gathering parties:

- May occur when an individual, or more likely a small group of closely related people, that are engaged in hunting activities (more likely to be a party of men) or gathering activities (more likely to involve women and children) camp overnight near the resource being procured.
- Duration would be one or several days.
- Total numbers of people would be relatively small.
- Would be expected to occur close to where food resources were available, which for different foods may be a seasonal or annual occurrence.
- Proximity to potable water probably was important, although temporary sources may have been sufficient.
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play, stone knapping activity, food processing or temporary camp fires.
- Quantity and density of evidence and range of artefact and stone types are expected to be low to moderate, and distinguishable from 'background discard'. A reasonably broad range of artefact and stone types may be discarded (although not as diverse as expected at a base camp). Items likely to be cached for future use at a base camp, or unlikely to be carried around on a hunting or gathering journey (such as grindstones) are not expected to occur. Time-consuming activities like construction and use of ovens or heat treatment pits are also unlikely to have occurred.

Nuclear/extended family base camp:

- May occur when a single nuclear family or extended family camps together.
- Duration uncertain but probably dependent on availability of food resources and potable water in the locality.
- Total numbers of people would be relatively small.
- Probably situated on level or very gently inclined ground.
- Probably situated close to potable water.
- Probably situated close to food resources (for example, conjunction of wetlands and forest zones).
- The encampment area may consist of a several small huts, dispersed in a spatial patterning depending on the social mix of the people.
- Evidence may represent accidental discard, repair of equipment, children's play, stone knapping activity, food processing, campfires, heat treatment of silcrete and manufacturing of tools.
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Repeated visits to a camp site or stays of long duration may cause a build-up of evidence over a period of time in a specific location. Items are likely to have been cached for future use at a base camp. Specific artefact indicators include grindstones. Evidence of casual knapping and production of tools is expected to be common. The significant differences with a temporary hunter/gatherer's camp include the possible presence of features such as heat treatment pits and ovens, broader range of artefact and stone types, presence of specific artefact indicators, higher density of evidence (reflecting more activity and longer duration of use) and relatively common evidence for the production of tools.

Community base camp:

- May occur when a number of nuclear families camp together.
- Duration uncertain but probably dependent on availability of food resources.
- Total numbers of people could be relatively large (30+).
- Probably situated on level or very gently inclined ground.
- Probably situated close to potable water.

- Probably situated close to food resources (for example, conjunction of wetlands and forest zones).
- The encampment area may exceed 100 m^2 and consist of a number of individual groups and huts, dispersed in a spatial patterning depending on the social mix of the groups.
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning). Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre. Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur.

Larger congregation of groups:

- May occur in relation to special events (such as major ceremonies) or when a particularly desirable food was most abundant.
- Probably of short duration (for example, less than two weeks) but potentially for longer duration (for example, up to three months).
- Total numbers of people could vary widely, but possibly exceed 100.
- Probably situated on level or very gently inclined ground.
- Probably situated close to potable water.
- Probably situated close to food resources.
- A large area or areas of encampments would be expected, possibly covering hundreds of square metres or more.
- Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning).
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high (similar to community base camp). Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre, and possibly evidence of processing uncommon foods for which the gathering may be related. Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur.

Ceremonial activity:

- May occur when a group of people gathers at a particular location to perform a ceremony.
- Evidence may be present of ceremonial site features such as earthen rings or stone arrangements, or ochre.
- Evidence of large encampments (similar to that expected for the 'larger congregation of groups' listed below) may be present nearby, particularly in locations with an aspect towards the ceremonial site.

To distinguish whether single or multiple episodes of occupation occurred, several factors can be examined. Multiple episodes of occupation would tend to exhibit superimpositioning of evidence (for example, a mix of unrelated stone materials and artefact types and activity areas). However, identifying which items belong to which activity events can be problematical. Also, distinguishing the effects of post-depositional disturbance from cultural superimpositioning is problematical (*cf*. Koettig 1994). The analysis of distributions of stone material and artefact types is of benefit in some circumstances.

Another indicator of multiple occupation is an expectation of a relatively higher density of artefacts within a locality (combined with superimpositioning as discussed above). Larger areas of occupation may also result, when occupations only partially overlap (Camilli 1989).

Identification of different episodes of occupation over time would require *in situ* deposits with stratified or vertically separated evidence of activity events and datable material.

Identification of the duration of individual episodes of occupation may prove very difficult. Where a single episode of occupation has occurred, a greater quantity of items and frequency of discrete activity events may be indicative of a longer stay.

Identification of the types of occupations when multiple episodes have occurred may prove highly problematical. Unless specific artefact indicators for different types of occupation are present, the superimpositioning of evidence from unrelated occupations (for example, transitory movement over a nuclear family base camp) may not be possible to determine.

Controlled hand excavation in a range of different environmental/cultural contexts is typically the minimum necessary to address these issues and enable testing of the occupation model.

3.5 Predictive Model of Site Location

A predictive model of site location is constructed to identify areas of archaeological potential (ie. locations where there is a probability of archaeological evidence occurring), so it can be used as a basis for the planning and management of Aboriginal heritage. Predictive modelling involves reviewing existing literature to determine basic patterns of site distribution. These patterns are then modified according to the specific environment of the investigation area to form a predictive model of site location. A sampling strategy is employed to test the predictive model and the results of the survey used to confirm, refute or modify aspects of the model.

The use of land systems and environmental factors in predictive modelling is based upon the assumption they provided distinctive sets of constraints which influenced Aboriginal land use patterns. Following from this is the expectation that land use patterns may differ between each zone, because of differing environmental constraints, and that this may result in the physical manifestation of different spatial distributions and forms of archaeological remains (Hall and Lomax 1993:26).

The predictive model is based on information from the sources:

- Identification of land systems and landform units;
- Previous archaeological surveys and excavations conducted within the region;
- Distribution of recorded sites and known site density;
- Traditional Aboriginal land use patterns; and
- Known importance of any parts of the investigation area to the local Aboriginal community.

In certain circumstances, such as where low surface visibility or recent sediment deposition precludes effective assessment of the potential archaeological resource, sub-surface testing may be a viable alternative for further testing the predictive model and assessing the investigation area.

The investigation area is located within the Central Lowlands portion of the Hunter Valley and generally comprises level to gently inclined simple slopes, drainage depressions and flats, with spur crests, ridge crests, hillocks and valley flats also present (refer to Section 2.2). As there is generally no potential for heritage evidence to exist in the areas classified as "modified" the remainder of this discussion relates to the unmodified investigation area.

The following site location predictions are made for the unmodified investigation area:

Artefact Scatters:

The definition of an artefact scatter 'site' is often an arbitrary one, which can offer benefits from a heritage management perspective but is a source of theoretical/analytical debate for heritage practitioners. In most archaeological contexts, an artefact scatter has been defined as either the presence of two or more stone artefacts within 50 or 100 metres of each other, or a concentration of artefacts at a higher density than surrounding low density 'background scatter'. Due to the nature of the underlying evidence, its identification only within exposures created by erosion or disturbance, and the limited suitability of existing definitions, artefact scatter sites are defined within this study as the presence of one or more stone artefacts within a *survey area* (*cf.* Kuskie 2000). The survey areas are based on discrete, repeated *environmental contexts* or *archaeological terrain units* (for example, a particular combination of landform unit and class of slope).

Each spatially discrete location of evidence within a survey area is defined as a site locus, with the boundaries of the site locus defined by the visible extent of artefacts (ie. Aboriginal objects protected under the *National Parks and Wildlife Act 1974*). However, as such a definition is somewhat arbitrary and does not necessarily reflect true cultural sites (temporally and spatially related evidence) and previous survey results lend support to the argument that artefacts are distributed across the landscape in a virtual continuum, but with evidence only identified in surface exposures or areas of disturbance, it is assumed that there is a similar probability for comparable evidence to occur elsewhere within the same survey area. Hence, while the visible site loci boundaries are defined by the extent of visible evidence (consistent with the definition of an Aboriginal object under the *National Parks and Wildlife Act 1974*), across the entire survey area in which a site is identified there exists a *potential resource* of comparable evidence.

An artefact scatter may consist of surface material only, which has been exposed by erosion, or it more typically involves a sub-surface deposit of varying depth. Other features may be present within artefact scatter sites, including hearths or stone-lined fireplaces, and heat treatment pits.

Artefact scatters may represent the evidence of:

- Camp sites, where everyday activities such as habitation, maintenance of stone or wooden tools, manufacturing of stone or wooden tools, management of raw materials, preparation and consumption of food and storage of tools has occurred;
- Hunting or gathering events;
- Other events spatially separated from a camp site (for example, tool production or maintenance); or
- Transitory movement through the landscape.

The detection of artefact scatters depends upon conditions of surface visibility and ground disturbance and whether recent sediment deposition has occurred (*cf*. Dean-Jones and Mitchell 1993). Vegetation cover and deposition of sediments generally obscures artefact scatter sites and prevents their detection during surface surveys. High levels of ground disturbance can also obscure or remove evidence of a site.

Within the investigation area, there is a high potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units within the unmodified area. Several open artefact sites have already been identified within the investigation area. A higher density of evidence is expected to occur where more focused and/or repeated Aboriginal occupation has occurred (for example, along higher order watercourses and on adjacent low gradient simple slopes and crests). Although recent human and natural post-depositional impacts may have affected to some extent a portion of the identified and potential Aboriginal heritage evidence, there may exist potential for deposits of sufficient integrity to be of research value.

Bora/Ceremonial Sites:

Bora grounds are a type of ceremonial site associated with initiation ceremonies. They are usually made of two circular depressions in the earth, sometimes edged with stone. Bora grounds can occur on soft sediments in river valleys and elsewhere, although occasionally they are located on high, rocky ground where they may be associated with stone arrangements.

The potential for bora/ceremonial sites within the investigation area is assessed as being very low, due in large part to the recent history of land use.

Burials:

Human remains tended to be placed in hollow trees, caves or sand deposits. Usually burials are only identified when eroding out of sand deposits or creek banks, or when disturbed by development. Aboriginal communities are strongly opposed to the disturbance of burial sites. The probability of detecting burials during archaeological fieldwork is extremely low.

The potential for burial sites to occur within the investigation area is considered to be low, although cannot be discounted.

Carved Trees:

Carved trees were still relatively common in NSW in the early 20th century (Etheridge 1918). They were commonly used as markers for ceremonial or symbolic areas, including burials.

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type extremely rare. Given these factors and the extent of recent land use impacts, the potential for carved trees to occur within the investigation area is considered to be very low.

Grinding Grooves:

Elongated narrow depressions in soft rocks (particularly sedimentary), generally associated with watercourses. The depressions are created by the shaping and sharpening of ground-edge hatchets.

Grinding grooves are most likely to be located in sedimentary bedrock along watercourses, and their potential to occur within the investigation area is dependent upon the presence of such bedrock. Considering the underlying geology of the investigation area, this potential is assessed as low to moderate for the drainage depression units and very low elsewhere.

Lithic Quarries:

A lithic quarry is the location of an exploited stone source (Hiscock and Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occurs. Reduction sites, where the early stages of stone artefact manufacture occur, are often associated with quarries.

Within the investigation area, lithic quarries only have potential to exist if outcrops of a suitable stone raw material such as silcrete or tuff are present. Considering the underlying geology and known presence of silcrete cobbles elsewhere in the region, this potential is assessed as low to moderate.

Middens:

Shell middens are a common site type in the coastal region. Middens are deposits of shell, the remains of what formed part of the Aboriginal diet. Middens may also include stone, bone or shell artefacts, charcoal, or the remains of small terrestrial or aquatic fauna, which were also a part of the diet. Middens exhibit wide variation in terms of their size, preservation and contents, and can provide significant information on land-use patterns, diet, chronology of occupation and environmental conditions.

Considering the distance of the investigation area from current shellfish sources, the potential for this type of evidence is assessed as very low. However, older sub-surface evidence (such as mid-late Holocene age) of midden deposits in close proximity to the former Hunter River estuary cannot be discounted at the eastern end of the investigation area, albeit the potential for survival of such evidence decreases with age due to natural post-depositional factors.

Mythological/Traditional Sites:

Mythological sites, or sites of traditional significance to Aboriginal people, may occur in any location. Often natural landscape features are the locations of mythological sites. Other sites of contemporary significance include massacre sites (the location of violent clashes between early settlers and local Aboriginals), traditional camp sites and contact sites. Consultation with the local Aboriginal community is essential to identify these site types.

Scarred Trees:

Scarred trees contain scars caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters.

Mature trees, remnants of stands of the original vegetation, have the potential to contain scars. Considering the long time period elapsed since this practice was prevalent, the extent of vegetation removal and the extent of recent land use impacts, the potential for scarred tree sites to occur within the investigation area is assessed as very low.

Stone Arrangements:

Stone arrangements include circles, mounds, lines or other patterns of stone arranged by Aboriginal people. Some were associated with bora grounds or ceremonial sites and others with mythological or sacred sites.

Hill tops and ridge crests which contain stone outcrops or surface stone, and have been subject to minimal impacts from recent land use practices, are potential locations for stone arrangements. Considering the extent of recent land use impacts, the potential for stone arrangements to occur within the investigation area is assessed as very low.

4. LEGISLATION

4.1 Commonwealth

While the primary legislation offering protection to Aboriginal heritage in NSW is enacted by the state, several Acts administered by the Commonwealth may also be relevant.

The *Aboriginal and Torres Strait Islander Heritage Protection Act, 1984*, provides for the protection of areas and objects which are of significance to Aboriginal people in accordance with Aboriginal tradition. The Act allows Aboriginals to apply to the Minister to seek protection for significant Aboriginal areas and objects. The Minister has broad powers to make such a declaration should the Minister be satisfied that the area or object is a significant Aboriginal area or object and is under immediate threat of injury or desecration. An 'emergency declaration' can remain in force for up to thirty days. It is an offence under the Act to contravene a provision of a declaration. Provisions are made for penalties of up to $50,000 for a corporation found guilty of contravening the Act and up to $10,000 and imprisonment for a maximum of five years, for a person found guilty of contravening the Act.

Under the Act, 'Aboriginal tradition' means:

> 'the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships' (Section 3).

A 'significant Aboriginal area' refers to:

> An area of land or water in Australia being of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3).

A 'significant Aboriginal object' refers to:

> An object (including Aboriginal remains) of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3).

For the purposes of the Act, an area or object is considered to be injured or desecrated if:

> a) in the case of an area, it is used or treated in a manner inconsistent with Aboriginal tradition; or the use or significance of the area in accordance with Aboriginal tradition is adversely affected by reason of anything done in or near the area; or passage through or over, or entry upon the area by any person occurs in a manner inconsistent with Aboriginal tradition; and
>
> b) in the case of an object, it is used or treated in a manner inconsistent with Aboriginal tradition (Section 3).

A new national heritage system commenced on 1 January 2004, largely replacing the previous *Australian Heritage Commission Act 1975*. Its primary features under the amended *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Australian Heritage Council Act 2003* include:

- A National Heritage List of places of national heritage significance;
- A Commonwealth Heritage List of heritage places owned or managed by the Commonwealth;
- Creation of the Australian Heritage Council – an independent expert body to advise the Minister on the listing and protection of heritage places; and
- Continued management of the Register of the National Estate, a list of more than 13,000 heritage places around Australia that has been compiled by the former Australian Heritage Commission since 1976.

4.2 State

The *National Parks and Wildlife Act 1974* (NP&W Act) provides the primary basis for the legal protection and management of Aboriginal heritage sites within NSW. Implementation of the Aboriginal heritage provisions of this Act in relation to development proposals is the responsibility of the Planning and Aboriginal Heritage Section of the Department of Environment, Climate Change and Water (NSW) (DECCW). The rationale behind the Act is to prevent unnecessary or unwarranted destruction of Aboriginal objects and to protect and conserve objects where such action is considered warranted (DECC 2009a, 2009b).

With the exception of some artefacts in collections, the Act generally defines all Aboriginal objects to be the property of the Crown. The Act then provides various controls for the protection, management and destruction of these objects. An 'Aboriginal object' is defined as

> 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains' [Section 5(1)].

In practice, archaeologists generally subdivide the legal category of 'object' into different site types, which relate to the way Aboriginal heritage evidence is found within the landscape. The archaeological definition of a 'site' may vary according to survey objectives, however it should be noted that even single and isolated artefacts are protected as objects under the Act.

Under the terms of the NP&W Act, it is an offence for a person to:

- Knowingly destroy, damage or deface an Aboriginal object or place, or knowingly cause or permit the destruction, defacement or damage to an Aboriginal object or place, without first obtaining the consent of the Director-General of DECCW;
- Disturb or excavate any land, or cause any land to be disturbed or excavated, for the purpose of discovering an object, without first obtaining the consent of the Director-General of DECCW; and
- Collect on any land an object that is the property of the Crown, other than an object under the control of the Australian Museum, without obtaining appropriate authorisation from the Director-General of DECCW.

Penalties for infringement of the Act include up to 50 penalty units or imprisonment for six months, or both (or 200 penalty units in the case of a corporation).

Consents regarding the use or destruction of objects are managed through the DECCW Aboriginal Heritage Impact Permit (AHIP) system. The issuing of permits is dependent upon adequate archaeological assessment and review, together with an appropriate level of Aboriginal community liaison and involvement. DECCW determination of permit applications is guided by the DECC (2009a) policy *Guide to Determining and Issuing Aboriginal Heritage Impact Permits*. Section 87 AHIPs are typically required (apart from Part 3A Major Projects) to disturb or move an Aboriginal object or disturb land for the purposes of discovering an Aboriginal object. Section 90 AHIPs are typically required (apart from Part 3A Major Projects) to allow any impacts to (for example to destroy, damage or deface) an Aboriginal object or Aboriginal place. The Director-General may attach any terms and conditions seen fit to any AHIP granted for the above activities. Failure to comply with a term or condition is deemed to be a contravention of the Act.

Under the Part 3A Major Project amendments to the *Environmental Planning and Assessment Act 1979*, subsequent to project approval being granted, a Section 90 AHIP to impact Aboriginal objects or a Section 87 AHIP under the NP&W Act is generally not required. *In lieu* however, a Part 3A application involving a Statement of Commitments outlining proposed heritage management and mitigation measures, must be approved by the Department of Planning. Typically, the assessment conducted by any applicant is required to comply with the DECC (2005) draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*, which itself requires conduct of the assessment in accordance with the consultation policy entitled *Interim Community Consultation Requirements for Applicants* (DECC 2004) and the *Aboriginal Heritage Standards and Guidelines Kit* (1997).

Also, under more recent Part 3A Major Project amendments (Section 75U{4}), a Section 87 AHIP is generally not required for the investigation of artefact deposits where the investigation is being undertaken for the purpose of complying with environmental assessment requirements issued in connection with an application for approval to carry out a project or for a concept plan for a project.

An appeals process is available whereby an applicant, dissatisfied with the refusal of the Director-General to grant a Section 90 AHIP, or with any conditions or restrictions attached to the Section 90 AHIP, may appeal to the Minister. The Minister may refuse to grant an appeal or partially or wholly grant an appeal. The decision of the Minister on the appeal is final and is binding on the Director-General and the appellant. The Land and Environment Court also has powers to consider whether a decision made under the NP&W Act (such as an AHIP) has been made legally (ie. in accordance with administrative law principles). Such a review may be requested by any person (DECC 2009b).

The Minister also has substantial powers under Section 12 to direct DECCW to carry out works and activities, either generally or in a particular case, in relation to the identification, conservation and protection of, and prevention of damage to, Aboriginal objects and places.

Under Section 30K of the NP&W Act, ‘Aboriginal areas’ may also be declared over private land, where Aboriginal objects or places are located, with the consent of the owner or occupier. The purpose of reserving land as an 'Aboriginal area' is to identify, protect and conserve areas associated with a person, event or historical theme, or containing a building, place, object, feature or landscape of natural or cultural significance to Aboriginal people, or of importance in improving public understanding of Aboriginal culture and its development and transitions.

Under Section 84 of the NP&W Act, 'Aboriginal places' may be declared by the Minister, by order published in the Gazette, over a place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture. Aboriginal places may or may not contain Aboriginal objects.

Under Section 91AA of the NP&W Act, if the Director-General is of the opinion that any action is being, or is about to be carried out that is likely to significantly affect an Aboriginal object or Aboriginal place or any other item of cultural heritage situated on land reserved under the Act, the Director-General may make a stop-work order for a period of 40 days. A person that contravenes a stop-work order may be penalised up to 1,000 penalty units and an additional 100 units for every day the offence continues (10,000 units and 1,000 units respectively in the case of a corporation).

Under Section 91 of the NP&W Act, a person who is aware of the location of an Aboriginal object that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after the person first becomes aware of that location is guilty of an offence against this Act unless the person believes on reasonable grounds that the Director-General is aware of the location of that Aboriginal object. The "prescribed manner" is currently taken to be Site Recording Forms published on the DECCW internet site (DECC 2009b).

Under Section 85A of the NP&W Act, the Director-General may "dispose" of Aboriginal objects that are the property of the crown:

a) By returning the Aboriginal objects to an Aboriginal owner or Aboriginal owners entitled to, and willing to accept possession, custody or control of the Aboriginal objects in accordance with Aboriginal tradition, or

b) By otherwise dealing with the Aboriginal objects in accordance with any reasonable directions of an Aboriginal owner or Aboriginal owners referred to in paragraph (a), or

c) If there is or are no such Aboriginal owner or Aboriginal owners - by transferring the Aboriginal objects to a person, or a person of a class, prescribed by the regulations for safekeeping (commonly known as a Care Agreement that is implemented between DECCW and the Aboriginal person or community organisation).

Under Section 85A(3) of the NP&W Act, the regulations may make provision as to the manner in which any dispute concerning the entitlement of an Aboriginal owner or Aboriginal owners to possession, custody or control of Aboriginal objects for the purposes of this section is to be resolved.

4.3 Local

Under the *Environmental Planning and Assessment Act 1979* the Minister may make various planning instruments such as Regional and Local Environment Plans. The *Singleton Local Environmental Plan 1996* (LEP), *Cessnock Local Environmental Plan 1989*, *Maitland Local Environmental Plan 1993* and *Hunter Regional Environmental Plan 1989 (Heritage)* (REP) apply to portions of the investigation area, although may not be relevant to this specific project as it is defined as an activity under Part 3A of the EP&A Act. The LEPs and REP contains several provisions relating to heritage and list heritage items within various schedules (1-5 of the REP, 3 of the Cessnock LEP, 1-2 of the Maitland LEP and 3 of the Singleton LEP).

The investigation area does not contain any heritage items registered for indigenous values under the Acts or planning instruments listed above, with the exception of Aboriginal objects protected under the *National Parks and Wildlife Act 1974*.

5. METHODOLOGY

5.1 Investigation and Survey Methodology

During the initial stages of the assessment, research was conducted into the environmental, cultural and archaeological background of the investigation area, and searches were undertaken of the DECCW Aboriginal Heritage Information Management System and other relevant heritage registers and planning instruments (refer to Section 3.1).

Consultation and involvement of the Aboriginal community was undertaken as per the requirements of the DECCW policy entitled *Interim Community Consultation Requirements for Applicants* (refer to Section 5.2).

Field inspection of the investigation area was undertaken by Dr Johan Kamminga, Caroline Ingram and Georgia Stannard of South East Archaeology over 20 days between 24 August and 2 October 2009, assisted by representatives of the registered Aboriginal stakeholders (refer to Section 5.2). Where required, consultation was also undertaken with local property owners.

Approximately 95.5 hectares (27%) of the 358 hectare investigation area has been extensively impacted by earthmoving works, typically associated with construction of the existing railway, such that there is negligible potential for any Aboriginal heritage evidence to survive. These areas are marked as "modified" on the detailed survey plans in Appendix 1. Visual inspection was made of these areas to confirm that negligible potential for heritage evidence exists, however detailed survey was generally not conducted within these areas.

The remainder of the investigation area (referred to as the "unmodified investigation area") comprised land in which there generally remains some potential for Aboriginal heritage evidence. This area measures 262.6 hectares and comprises 73% of the investigation area. The detailed archaeological survey focused on the unmodified investigation area.

The entire length of the unmodified investigation area was inspected on foot along both sides of the existing rail track, including broader areas that extend a further distance from the track, apart from approximately 32.9 hectares or 9% of the investigation area that could not be surveyed, primarily due to property access constraints.

The unmodified investigation area was divided into particular combinations of environmental variables that are assumed to relate to Aboriginal usage of the area. These *archaeological terrain units* or *environmental contexts* were defined on the basis of landform element and class of slope (following McDonald *et al* 1984). They are discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location may be extrapolated to other similar locations. Therefore survey areas were defined as the individual environmental context that is bounded on all sides by different environmental contexts (*cf.* Kuskie 2000).

Detailed recording of the archaeological survey areas was made on survey recording forms, including environmental variables and heritage resources identified or potentially present. Each survey area was assigned a unique reference code (MM1 to MM303) after the Maitland to Minimbah initials. Details of each survey area are presented in Appendix 2 and mapping of each survey area is presented in Appendix 1. Surveying was generally completed within a single survey area prior to commencing inspection of another area. However, due to property access issues and various survey priorities specified by the Hunter 8 Alliance, the survey did not proceed in a systematic, continuous manner from one end of the route to the other.

Due to logistical reasons, additional archaeological survey coverage was also obtained of some adjacent areas outside of the investigation area. For the purposes of this assessment, the total area subject to survey sampling is defined as the *analysis area*. Approximately 72% of the analysis area corresponds to the investigation area and 28% of the analysis area comprises land immediately adjacent to the investigation area.

Aboriginal heritage site recording forms for each identified site were also completed. Spatially separate locations of heritage evidence were recorded as separate sites named after the locality in which they were situated, followed by a sequential number. For example, the sites identified within the vicinity of Allandale were recorded as 'Allandale Rail 1', 'Allandale Rail 2', etcetera. Details of each Aboriginal site recorded during the present survey and those previously recorded sites within the current investigation area are presented in Appendix 3.

Stone artefacts were recorded on a lithic item recording form, including details about provenance, stone material type, artefact type, size class, cortex and other relevant attributes. Details of each stone artefact recorded during the present survey are presented in Appendix 4.

Each survey area was inspected on foot by the archaeologists and Aboriginal representatives, largely in accordance with the proposed methodology provided to and originally agreed by the Aboriginal stakeholders. Notwithstanding the methodology approved by the Aboriginal stakeholders, in which it was specified that several study teams may work simultaneously on the survey, in order to address concerns raised by the Aboriginal stakeholders during the initial days of the survey the inspection was completed by the archaeologists and representatives working together as a single survey team.

Within each survey area:

- Inspection was made for stone artefacts, focusing on areas with ground surface visibility; and
- Inspection was made for obtrusive site types such as scarred trees and grinding grooves.

During the survey Aboriginal stakeholders were also asked of their knowledge of any areas of cultural significance within the investigation area, for example:

- Sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from the pre-contact period and have persisted until the present time;
- Sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites); and
- Sites or places of contemporary significance (apart from those areas for which Aboriginal objects remain, which are discussed above), for which the significance has been acquired in recent times.

The results of the investigation are presented in Section 6. Photographs of the identified sites are presented in Appendix 3. A glossary defining technical terms is presented in Appendix 5.

5.2 Aboriginal Consultation

The majority of the investigation area (all east of Black Creek) lies within the boundaries of the Mindaribba Local Aboriginal Land Council (LALC), while the portion west of Black Creek (two kilometres west of Branxton) lies within the boundaries of the Wanaruah LALC. The investigation area also lies within an area of interest to other Aboriginal persons and organisations.

The Aboriginal heritage impact assessment has involved a program of consultation with the Aboriginal community that complies with the policy requirements of DECCW that were introduced on 1 January 2005. These requirements are specified in the policy entitled *Interim Community Consultation Requirements for Applicants* (2004) and involve the following procedures:

1) Providing written notification of the project to the LALC, DECCW, Registrar of Aboriginal Owners (Department of Aboriginal Affairs), NSW Native Title Services and relevant Local Councils, requesting that if they are aware of any Aboriginal persons/organisations who may wish to be consulted about the project to provide such advice in writing, with a minimum 10 day response period;

2) Providing written notification of the project directly to those Aboriginal persons/organisations that were identified in Procedure 1 above, requesting those who may be interested in participating in the project to register their interest in writing, with a minimum 10 day response period;

3) Placing a media advertisement to the same effect in the local press requesting any Aboriginal persons/organisations who may be interested in participating in the project to register their interest in writing, with a minimum 10 day response period;

4) Providing detailed information about the heritage impact assessment, including the proposed methodology, to the Aboriginal persons/organisations who registered their interest in writing in Procedures 1-3 above, with a minimum 21 day response period for comments;

5) Comments received from registered Aboriginal persons/organisations in Procedure 4, including information on areas of cultural significance, potential culturally acceptable mitigation measures, the nature of the assessment methodology and any other relevant traditional knowledge or issues, must be considered in order to finalise the assessment methodology;

6) Field inspection in consultation with the registered Aboriginal stakeholders;

7) Notifying the registered Aboriginal stakeholders and the LALC (even if not registered) of the availability of the draft Aboriginal heritage impact assessment report and their comments invited; and

8) Preparation of a final Aboriginal heritage impact assessment report that addresses and incorporates the input of the registered Aboriginal stakeholders.

Procedures #1-8 outlined above have been implemented, as documented in the consultation database in Appendix 6 and below.

Compliance with Procedure #1 was achieved through correspondence forwarded to the relevant organisations on 6 April 2009. Maitland City Council responded on 14 April 2009 to advise that the Mindaribba LALC should be contacted. DECCW responded on 17 April 2009 and advised that 29 Aboriginal groups or individuals, in addition to the LALCs, should be contacted. The Registrar of Aboriginal Owners responded on 20 April 2009 to advise that there are no Registered Aboriginal Owners for this area but that the Mindaribba LALC can be contacted to assist further.

Compliance with Procedure #2 was achieved by writing on 20 April 2009 to the organisations named above by DECCW with an invitation to register an interest as per the DECCW policy.

Compliance with Procedure #3 was achieved by placing advertisements in the Public Notices sections of The Singleton Argus and The Maitland Mercury on 7 April 2009 and The Cessnock Advertiser on 8 April 2009, requesting any Aboriginal persons/organisations who may be interested in participating in the project to register their interest in writing. Aboriginal Native Title Consultants registered an interest in the project and also advised the consultant to contact an additional five Aboriginal groups. These organisations were also written to (where they had not already been contacted), with an invitation to register an interest as per the DECCW policy.

At the conclusion of Procedures #1-3, the following 20 organisations or individuals had registered an interest in the assessment:

- Aboriginal Native Title Consultants;
- Black Creek Aboriginal Corporation;
- Cacatua Culture Consultants;
- Culturally Aware;
- Gidawaa Walang;
- Hunter Traditional Owner Environmental Management Services;
- Hunter Valley Aboriginal Corporation;
- Hunter Valley Cultural Surveying;
- Lower Hunter Wonnarua Council;
- Mindaribba LALC;
- Ungooroo Aboriginal Corporation;
- Ungooroo Cultural and Community Service;
- Upper Hunter Wonnarua Council;
- Wanaruah LALC;
- Wattaka Wonnarua Cultural Consultants Service;
- Wonn 1 Contracting;
- Wonnarua Culture Heritage;
- Wonnarua Elders Council;
- Wonnarua Nation Aboriginal Corporation; and
- Yinarr Cultural Services.

Compliance with Procedures #4 and 5 was achieved by writing on 20 May 2009 to the 20 organisations that registered an interest, providing them with a proposed methodology for the assessment for their consideration and comment by 16 June 2009. ARTC's Selection Criteria and request for insurance were also forwarded to the registered groups for completion with supporting documentation (such as insurance certificates of currency) for those registrants wishing to be considered by ARTC for participation in the field survey.

Responses were received from 14 of the 20 registered stakeholders:

- Cacatua Culture Consultants - responded to the selection criteria and agreed with the proposed methodology;
- Culturally Aware - responded to the selection criteria;
- Gidawaa Walang - responded to the selection criteria and agreed with the proposed methodology;
- Hunter Traditional Owner Environmental Management Services - responded to the selection criteria;
- Hunter Valley Aboriginal Corporation - responded to the selection criteria;
- Hunter Valley Cultural Surveying - responded to the selection criteria;
- Lower Hunter Wonnarua Council - responded to the selection criteria;
- Mindaribba LALC - responded to the selection criteria and agreed with the proposed methodology. In addition, requested that any artefacts subsequently collected from within the LALC boundaries are curated at the Land Council Museum and any analysis on these artefacts is conducted at the LALC office;
- Ungooroo Aboriginal Corporation - responded to the selection criteria;
- Ungooroo Cultural and Community Service - responded to the selection criteria;
- Upper Hunter Wonnarua Council - responded to the selection criteria;
- Wanaruah LALC - responded to the selection criteria and agreed with the proposed methodology;
- Wonnarua Nation Aboriginal Corporation - responded to the selection criteria; and
- Yinarr Cultural Services - responded to the selection criteria and agreed with the proposed methodology.

Based on the responses to the selection criteria, ARTC decided to engage a representative from nine organisations to provide assistance with the field survey (refer below). The Mindaribba LALC requested that two Land Council representatives be engaged, and this was subsequently agreed to by ARTC.

Compliance with Procedure #6 was achieved by undertaking the field survey in consultation with the nine registered Aboriginal stakeholders that responded to the selection criteria, provided evidence of insurance cover, sought further involvement in the project and were selected for paid participation by ARTC on the basis of their responses to the selection criteria.

Fieldwork was undertaken over 20 days between 24 August and 2 October 2009, with assistance provided by[5]:

- Culturally Aware - Kirstin Berry, Jesse Waugh, Kerrod Lawrence and Justin Gover;
- Hunter Valley Aboriginal Corporation - Bruce Tunks, Michael Robertson and Gordon Swan;
- Lower Hunter Wonnarua Council - Tom Miller, Dean Miller, Stephen Talbot and Daniel Scott;
- Mindaribba LALC - Stephen Talbot, Ricki-Jo Griffiths, Tamika Matthews, Tanille Griffiths, Terrance Shephard, Ivan Smith, Jason Brown and Christine Dever;
- Ungooroo Cultural and Community Service - Rhonda Ward, Samantha Ward, Jesse Waugh and Kirstin Berry;
- Upper Hunter Wonnarua Council - Georgina Berry, Kirstin Berry and Matt Wells;
- Wanaruah LALC - Norm Archibald, Sarah Hall, Katrina Cavanaugh and Clifford McGrady;
- Wonnarua Nation Aboriginal Corporation - Maree Waugh; and
- Yinarr Cultural Services - Bruce Tunks, Michael Robertson, Susan Cutmore, Norm Archibald and Gordon Swan.

After the completion of much of the fieldwork, another organisation (Yarrawalk Enterprises) identified itself as having an interest in the project. As such, in accordance with the DECCW consultation guidelines, this organisation will also be notified of the draft report and their comments invited.

The representatives did not disclose any specific knowledge of sites or places associated with ceremonies, spiritual/mythological beliefs or traditional knowledge, which date from the pre-contact period and have persisted until the present time, within the investigation area. The representatives also did not disclose any specific knowledge of sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites), within the investigation area. The possibility cannot be excluded however, that traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted.

The representatives did however disclose a number of associations with the investigation area of contemporary significance, including:

- In general terms, the use of subsistence or other resources, with comments made about the presence of various native flora and fauna where observed within the investigation area. These comments were not of a historical nature (ie. did not relate to plant and animal resource use areas known from the post-contact period) but rather were general observations of the occurrence of particular species and their known traditional uses (for example, for food, medicine or tools);

[5] Generally, a representative of each group was present for every day of the survey, apart from on a small number of occasions where the representative was unable to attend for undisclosed reasons (refer to Consultation Database in Appendix 6 for full details).

- In general terms, the traditional use of the area by Wonnarua people, and an ongoing cultural and spiritual connection to the land by Wonnarua people; and
- In relation to the Aboriginal objects identified within the investigation area (for example, stone artefact sites), the contemporary significance of these to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors.

Compliance with Procedure #7 was achieved by providing copies of the draft heritage assessment report to the 20 registered Aboriginal stakeholders, along with Yarrawalk Enterprises, with a request for their comment.

Compliance with Procedure #8 was achieved through preparation of a final Aboriginal heritage impact assessment report that addressed and incorporated any input received from the registered Aboriginal stakeholders. Comments were received from the Mindaribba LALC and Wanaruah LALC in relation to both this draft report and the separate report prepared for the Hermitage Road, Nelson Street and Station Lane Review of Environmental Factors (REF) (Kuskie 2009c). Comments were also received from Gidawaa Walang endorsing the recommendations of the REF report and Wonnarua Nation indicating satisfaction with the present report (refer to Appendix 6).

The Wanaruah LALC response in relation to the present report, and several pertinent comments relevant to the REF report, are addressed in Table 1 where required. The Wanaruah LALC agreed in general with the report methodology, findings and recommendations, including the need to survey areas for which property access was not available, to salvage sites that will be impacted, and to protect sites that will not be impacted. The Wanaruah LALC requested ongoing involvement in future survey and excavation, for the entire Project area not just within the Wanaruah LALC boundaries, and a role in determining the curation of any salvaged artefacts.

The Mindaribba LALCs initial response in relation to the draft REF heritage report (refer to Appendix 6 and Table 1) noted concerns about the initial methodology, low surface visibility and lack of access to some areas. The Mindaribba LALC endorsed the recommendation for heritage awareness training and noted general agreement with most recommendations, but stated that the LALC will not support a Section 90 AHIP for the Aboriginal sites to be impacted until a meeting has been held with the Proponent to discuss the recommendations and a binding agreement reached. In relation to the EA report, the Mindaribba LALC identified that sub-surface investigations should be undertaken in areas identified by the stakeholders and genuine consultation should occur with respect to the Project, with the Aboriginal Heritage Management Plan to be developed in consultation with the major stakeholders by a suitably qualified person (refer to Appendix 6 and Table 1).

In addition to the implementation of Procedures #1-8 of the DECCW policy discussed above, additional consultation has been undertaken with the registered stakeholders by the Hunter 8 Alliance and South East Archaeology, outside of the formal DECCW process. This consulation is documented in Appendix 6.

Principally the additional consultation has involved the establishment of an Indigenous Liaison Committee (ILC) by the Hunter 8 Alliance. The ILC has involved representatives of the Hunter 8 Alliance and five Aboriginal representatives selected by those stakeholders engaged for the field investigation. The ILC was formed during a meeting convened on the third day of the field investigation, to discuss and address issues raised by the Aboriginal stakeholders during the initial days of the survey. It also provides an avenue for the Hunter 8 Alliance to build an ongoing relationship with the Aboriginal community in the Project area.

It has subsequently met on three occasions to discuss issues associated with the Project and of general relevance to the Aboriginal community and ARTC.

A number of issues have been raised by the registered Aboriginal stakeholders during the course of the assessment. The key issues raised and how they have been addressed are outlined in Table 5.1.

Table 5.1: Summary of Aboriginal stakeholders key comments and responses.

Issue #	Issue	Raised by	Hunter 8 Alliance Response
1	Enquiry as to why organisation wasn't selected by ARTC for paid participation in field survey.	Des Hickey (Wattaka); Luke Hickey (HVCS); Arthur Fletcher (Wonn 1 Contracting); John Matthews (ANTC); Donna Sampson (Cacatua);	ARTC decision based on responses to selection criteria and request for insurance.
2	Representatives want all Project areas surveyed, including within rail reserve.	Meeting of stakeholders engaged for field survey, 26/8/09	Survey to continue within all areas property access is available for, but with consideration of safety issues within rail reserve.
3	Measures should be implemented to ensure that sites located during Project are not inadvertently impacted, as occurred in Stage 1 Project.	Meeting of stakeholders engaged for field survey, 26/8/09	All sites within rail reserve to be fenced as soon as practical after discovery, and also within private property where land owners consent can be obtained. Relevant information to be provided to staff and land owners.
4	Working in separate, multiple survey teams unsatisfactory for Aboriginal stakeholders.	Meeting of stakeholders engaged for field survey, 26/8/09	Remainder of survey to be conducted with a single survey team, rather than multiple teams working simultaneously on different portions of the route.
5	Representatives requested greater consultation by the proponent with the Aboriginal community.	Meeting of stakeholders engaged for field survey, 26/8/09	Hunter 8 Alliance agreed to formation of ILC with meetings at least once a month. Representatives selected five persons/organisations to join the ILC.
6	Geotechnical drilling occurring within rail corridor in connection with EA investigation but in absence of archaeological survey or Aboriginal monitoring.	Rick Griffiths (MLALC)	Requested archaeological team to survey those areas as a priority and engaged the LALC to monitor drilling.
7	Concern expressed about surveying in long grass and potential for snakes.	Rhonda Ward (Ungooroo CCS), first ILC meeting	Appropriate PPE, such as gators, were recommended.
8	Yarrawalk requested inclusion in Project assessment and field survey.	Scott Franks (Yarrawalk)	Met with Scott Franks. Discussed options for input and involvement, but could not agree to participation in field survey due to Yarrawalk's failure to register an interest earlier, meaning any inclusion now would prejudice the process applied with respect to all other stakeholders.
9	Representatives requested more adequate mapping of investigation area.	Survey participants, 17/9/09	Better quality mapping produced and delivered to all Aboriginal survey participants.

Issue #	Issue	Raised by	Hunter 8 Alliance Response
10	Fencing agreements for Aboriginal sites could not be reached with many private land owners.	Hunter 8 Alliance at second ILC meeting	Representatives agreed for survey to proceed in areas where fencing arrangements could not be obtained, providing that each owner was written to advising them of site locations and their statutory responsibilities, with the representatives to fence the sites as soon as the land could be acquired.
11	Wanaruah LALC expressed dissatisfaction with selection process, on behalf of its members who had expressed individual interests in the Project.	Suzie Worth (WLALC) at second ILC meeting	Tom Miller, Rick Griffiths and others disagreed and stated that the project has consulted with the right people, and that the WLALC should not be writing on behalf of other organisations. SEA advised that any other organisations should communicate directly to the project team.
12	ILC not representative of Wattaka's interests.	Des Hickey (Wattaka)	Explained role of ILC and selection process. Consultation will continue with Wattaka as per the DECCW guidelines.
13	Areas not surveyed due to access constraints should be surveyed when access is available.	Suzie Worth (WLALC) in response to draft EA report	Recommendation included in draft and final report to this effect.
14	All sites within the impact area should be salvaged.	Suzie Worth (WLALC) in response to draft EA report	Recommendation included in draft and final report to this effect.
15	Nearby sites that are not to be impacted should be protected.	Suzie Worth (WLALC) in response to draft EA report	Recommendation included in draft and final report to this effect.
16	All artefacts salvaged within the Wanaruah LALC boundary are to be temporarily located at the LALC and their final curation to be determined by the Wonnarua stakeholders at a future time to be agreed.	Suzie Worth (WLALC) in response to draft EA report	Recommendation included in draft and final report to this effect.
17	Wanaruah LALC wishes to be involved in all future heritage survey and excavation across the entire Project area.	Suzie Worth (WLALC) in response to draft EA report	Recommendation included in draft and final report to this effect, although extent of involvement in Mindaribba LALC area to be determined by ARTC in consultation with other stakeholders.
18	Initial concerns about methodology not addressed during survey.	Rick Griffiths (MLALC) in response to REF report	A meeting of stakeholders was convened as soon as practical and all issues raised were addressed (refer above).
19	Areas not surveyed due to access constraints unsatisfactory.	Rick Griffiths (MLALC) in response to REF report	Recommendation included in draft and final REF and EA reports to ensure these areas surveyed.
20	Heritage awareness training should occur and if any sites are impacted, prosecution should occur.	Rick Griffiths (MLALC) in response to REF report	Recommendation included in draft and final REF and EA reports to this effect.
21	Requested meeting with Proponent and SEA to discuss recommendations and that a binding agreement be reached, prior to any LALC support for a s90 AHIP. Sought genuine consultation with respect to Project and Heritage Management Plan to be developed in consultation with major stakeholders by a suitably qualified person.	Rick Griffiths (MLALC) in response to REF report. Rick Griffiths (MLALC) in response to REF report	The Proponent and SEA will meet with the Mindaribba LALC as soon as practical to discuss the recommendations and seek agreement with respect to a s90 AHIP for the REF areas and Aboriginal Heritage Management Plan for the EA Project. Recommendation included in draft and final EA report with respect to development of AHMP in consultation with stakeholders.
22	Sub-surface investigations should be conducted in areas identified by stakeholders.	Rick Griffiths (MLALC) in response to EA report	Recommendation included in draft and final REF and EA reports to this effect.

6. RESULTS AND DISCUSSION

6.1 Survey Coverage

The unmodified investigation area has been subdivided into 303 survey areas, all of which were inspected for Aboriginal heritage evidence. The environmental contexts surveyed included the seven landform elements and four classes of slope present (Table 6.1). The entire length of the unmodified investigation area was inspected on foot along both sides of the existing rail track, including broader areas that extend a further distance from the track, apart from approximately 32.9 hectares or 9% of the investigation area that could not be surveyed, primarily due to property access constraints.

The locations of the individual survey areas are marked on detailed survey plans in Appendix 1 and descriptions are presented in Appendix 2. A summary of the survey coverage is presented in Table 6.1 for the combined environmental contexts.

Visual inspection confirmed that negligible potential for heritage evidence exists within the approximately 95.5 hectares (27%) of the 358 hectare investigation area that has been extensively impacted by earthmoving works, typically associated with construction of the existing railway (areas marked as "modified" in Appendix 1).

The remainder of the investigation area (referred to as the "unmodified investigation area") measures 262.6 hectares and comprises 73% of the investigation area. A total of 229.7 hectares, or 87% of the unmodified investigation area, was sampled through the detailed archaeological survey. Due to property access constraints, 32.9 hectares could not be sampled (representing 13% of the unmodified investigation area, or 9% of the overall investigation area).

In addition to this survey coverage, due to logistical reasons additional coverage was also obtained of some adjacent areas outside of the investigation area. For the purposes of this assessment, this total area subject to survey sampling is defined as the *analysis area*. Approximately 72% (229.7 hectares) of the analysis area corresponds to the investigation area and 28% (87.4 hectares) of the analysis area comprises land immediately adjacent to the investigation area.

The archaeological survey resulted in detailed sampling coverage within a total *analysis area* of 317.1 hectares. Total survey coverage (ground physically inspected for heritage evidence) equated to approximately 1,022,285 m^2, or 32.2% of the analysis area. As this coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types was significantly greater than this. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 15,033 m^2, or 0.5% of the analysis area.

Table 6.1: Survey coverage and artefact summary in relation to the analysis area.

Slope	Landform	Area (m^2)	% Comprises of Analysis Area	Total Area Sampled (m^2)	% Sampled of Context	Effective Survey Coverage Total (m^2)	% Effective Survey Coverage of Context	Total # Artefacts	Artefact Density per m^2 of Effective Survey Coverage
level - very gentle	drainage depression	165,237	5.21%	38,690	23.4%	979	0.59%	5	0.005
gentle	drainage depression	426,681	13.46%	116,260	27.2%	2,756	0.65%	47	0.017
moderate	drainage depression	93,981	2.96%	19,210	20.4%	266	0.28%	4	0.015
steep	drainage depression	10,038	0.32%	7,580	75.5%	6	0.06%	0	-
level - very gentle	flat	240,572	7.59%	96,970	40.3%	485	0.20%	4	0.008
level - very gentle	valley flat	9,139	0.29%	5,600	61.3%	112	1.23%	0	-
level - very gentle	simple slope	470,964	14.85%	221,670	47.1%	3,743	0.79%	112	0.030
gentle	simple slope	1,377,642	43.45%	438,165	31.8%	4,604	0.33%	127	0.028
moderate	simple slope	185,909	5.86%	38,460	20.7%	390	0.21%	1	0.002
steep	simple slope	1,672	0.05%	1,050	62.8%	5	0.30%	0	-
level - very gentle	spur crest	52,507	1.66%	9,530	18.1%	809	1.54%	2	0.003
gentle	spur crest	60,820	1.92%	12,480	20.5%	694	1.14%	22	0.032
moderate	spur crest	1,798	0.06%	1,600	89.0%	8	0.44%	0	-
level - very gentle	ridge crest	43,190	1.36%	6,000	13.9%	120	0.28%	0	-
gentle	ridge crest	14,868	0.47%	2,200	14.8%	22	0.15%	192	8.727
steep	ridge crest	927	0.03%	220	23.7%	1	0.11%	0	-
level - very gentle	hillock	2,331	0.07%	1,400	60.1%	7	0.30%	0	-
gentle	hillock	2,014	0.06%	2,000	99.3%	10	0.50%	0	-
steep	hillock	10,542	0.33%	3,200	30.4%	16	0.15%	0	-
		3,170,832 (Total)	100% (Total)	1,022,285 (Total)	32.2% (Mean)	15,033 (Total)	0.47% (Mean)	516 (Total)	0.034 (Mean)

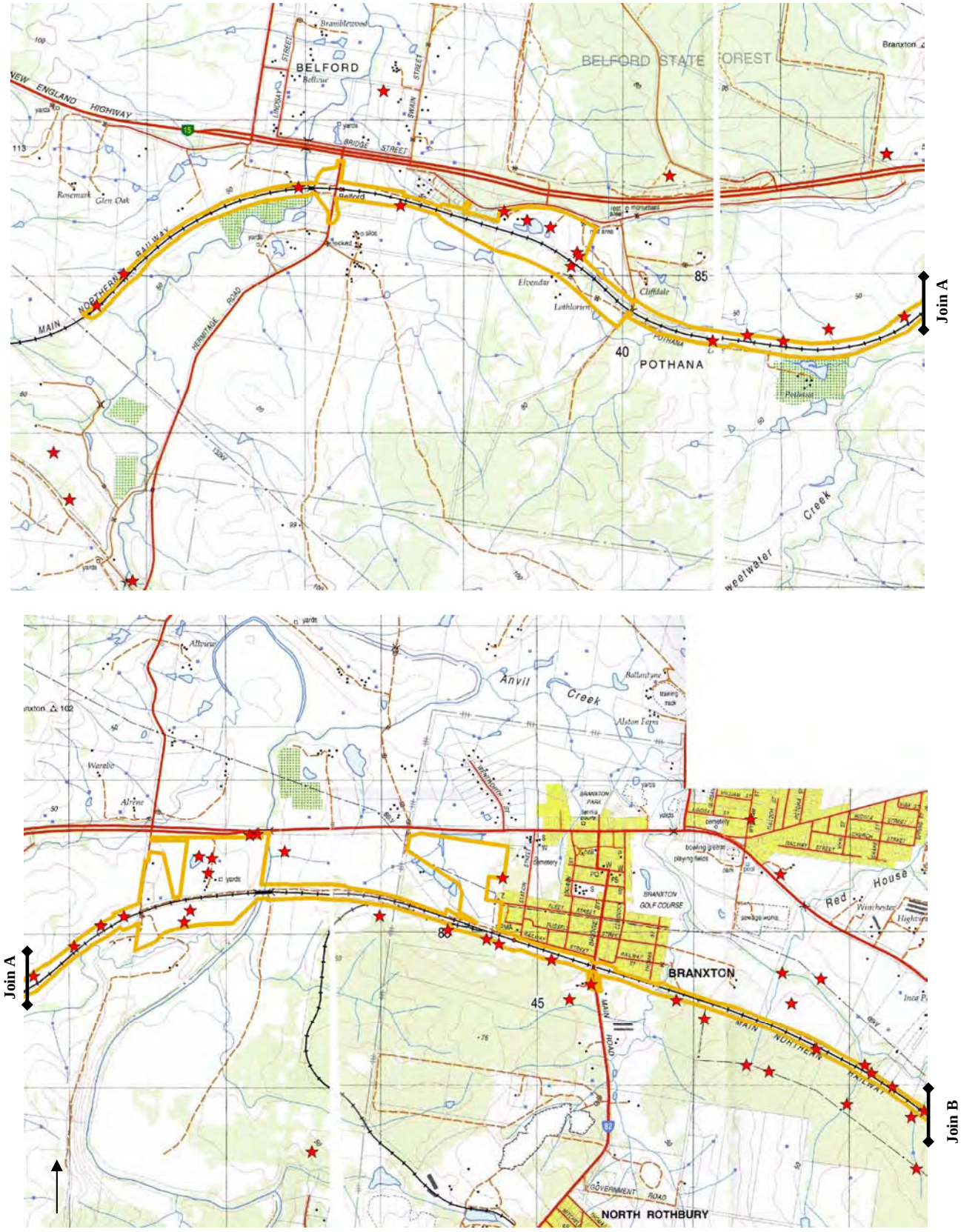


Figure 6.1 (a): Location of Aboriginal heritage evidence within the investigation area (red stars; base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; previously recorded Aboriginal site locations courtesy DECCW AHIMS). Refer to Appendix 1 for detailed mapping.

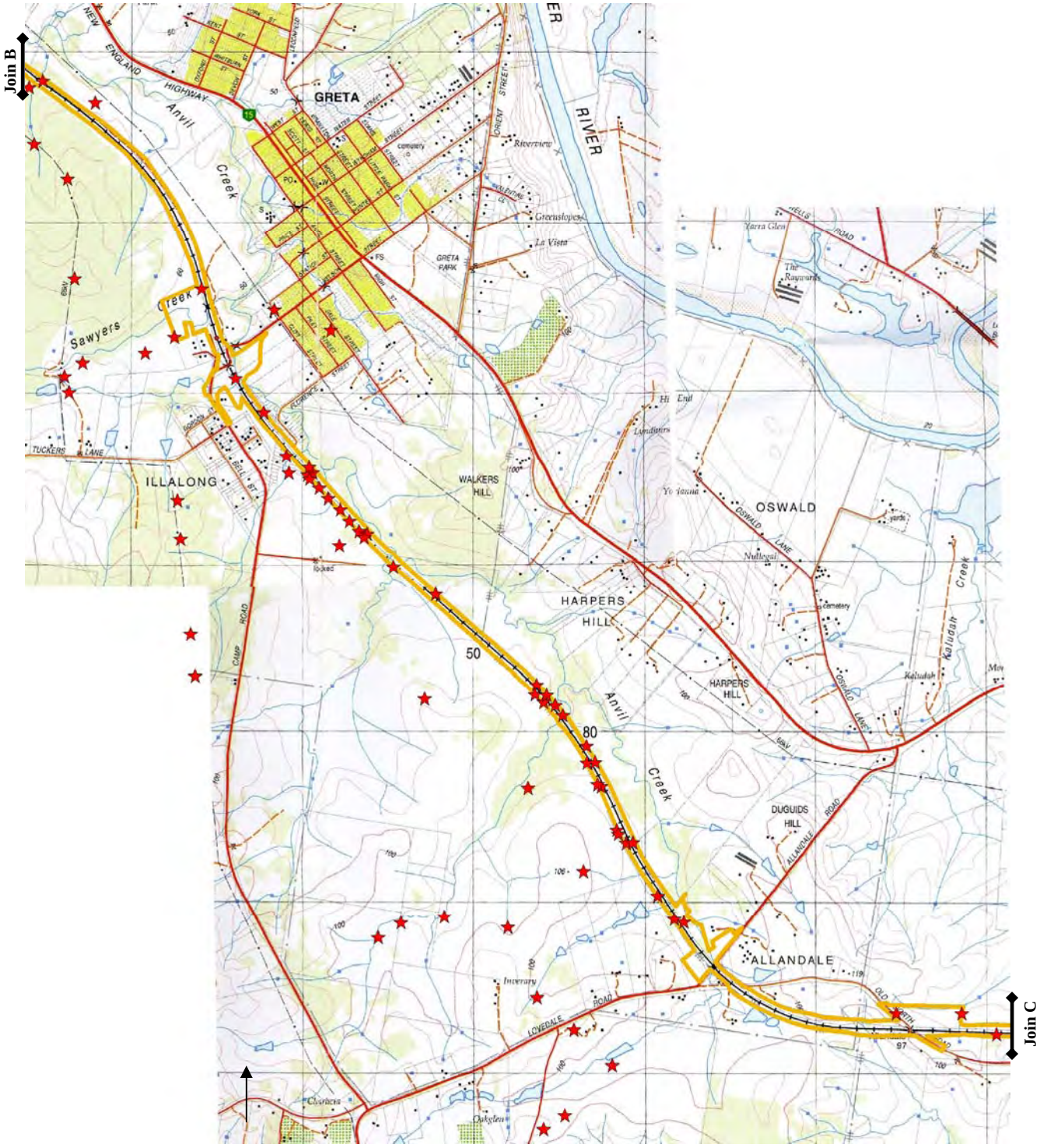
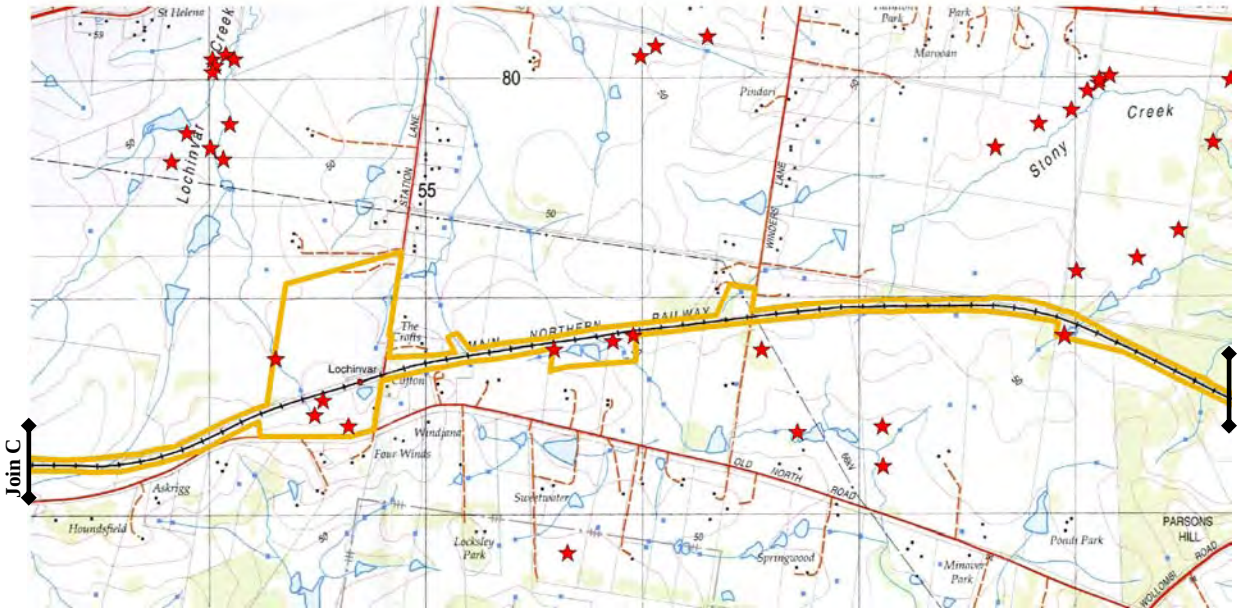


Figure 6.1 (b): Location of Aboriginal heritage evidence within the investigation area (red stars; base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; previously recorded Aboriginal site locations courtesy DECCW AHIMS). Refer to Appendix 1 for detailed mapping.



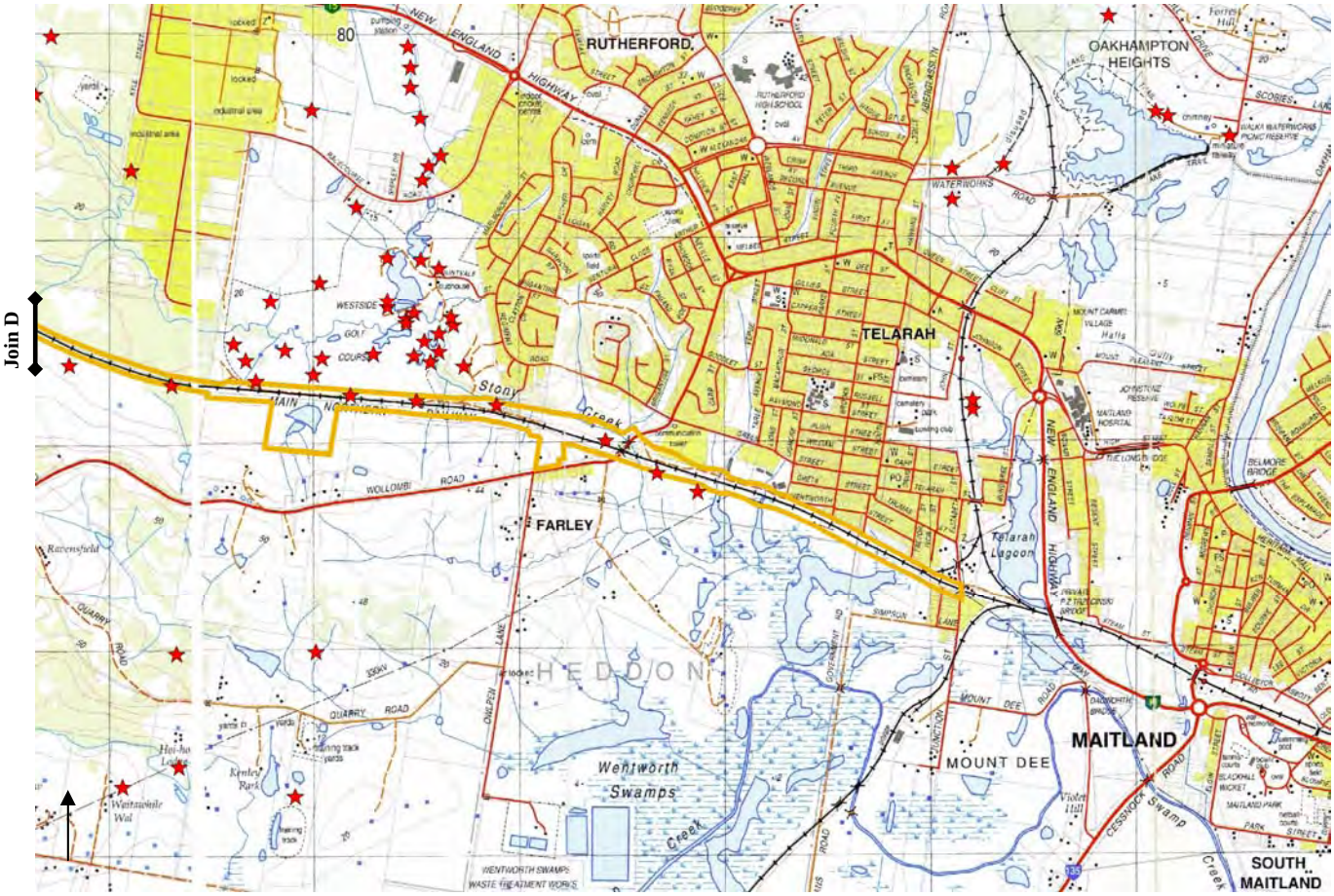


Figure 6.1 (c): Location of Aboriginal heritage evidence within the investigation area (red stars; base map Greta 9132-1S and Maitland 9232-4S 1:25,000 MGA topographic maps, reduced; previously recorded Aboriginal site locations courtesy DECCW AHIMS). Refer to Appendix 1 for detailed mapping.

Conditions of surface visibility were variable across the analysis area, but typically very low due to the dense cover of grass and other vegetation. Areas of higher visibility were present in association with vehicle tracks, farm dams, drainage control works, telecommunications cables and other areas of earthworks and ground disturbance, and in areas of erosion. Archaeological visibility, the actual visible ground surface with potential for heritage evidence (accounts for factors such as ground disturbance and sediment deposition), occurred in a similar pattern to surface visibility (mean of just 1.5% across the total survey sample). However, archaeological visibility was generally much lower than surface visibility due to factors such as extensive earthworks, erosion or other ground disturbance having totally removed the cultural-bearing A unit soil, or recent sediment deposition obscuring the A unit soil.

Few mature native trees exist within the investigation area. These were inspected for evidence of Aboriginal scarring but none was identified. Minor areas of exposed sandstone and sedimentary bedrock were identified within the investigation area. Visible bedrock was inspected for the presence of grinding grooves, with one site identified (refer to Section 6.2). In the elevated terrain of the investigation area, colluvial gravels are common, including minor silcrete, quartz and tuff. These materials were suitable for artefact manufacture and it is possible that stone was procured by Aboriginal people from sources within the investigation area, although direct evidence of such was not identified.

Notwithstanding the low surface visibility and resulting low proportion of effective survey coverage as a percentage of the entire analysis area, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the investigation area. The coverage was comprehensive for obtrusive site types (for example, scarred trees) but limited for the less obtrusive stone artefacts. Nevertheless, in view of the predictive modelling and results obtained from the sample of effective coverage, it is concluded that the survey provides a valid basis for determining the probable impacts of the Project and formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

6.2 Aboriginal Heritage Evidence

A total of 82 Aboriginal heritage sites were identified and recorded during the archaeological survey within the broader *analysis area*. This total comprises 81 open artefact sites and one grinding groove site, but excludes 14 previously recorded open artefact sites within approximately 50 metres of or directly in the investigation area that could not be relocated during the present survey.

The details of these sites are presented in Appendix 3 and site locations are marked on Figure 6.1 and the detailed plans in Appendix 1. Photographs of each site are also presented in Appendix 3. Details of the lithic items are presented in Appendix 4 and summarised in Table 6.2.

In total, 92 Aboriginal heritage sites are known to occur in or within about 50 metres[6] of the present *investigation area*. These sites comprise 91 open artefact sites and one grinding groove site, and are listed in Table 10.1. The known sites within the *investigation area* comprise:

- 77 open artefact and one grinding groove site identified and recorded during the present survey (Allandale Rail 1-21, Belford Rail 1-13 and 15, Branxton Rail 1-7 and 9-16, Greta Rail 1 and 3-19, Lochinvar Rail 1-4, Rutherford Rail 1-2 and Station Lane 1-3);
- 13 previously recorded open artefact sites listed on the DECCW AHIMS register that could not be relocated (37-6-1315, 37-6-1324, 37-6-1339, 37-6-1340, 37-6-1370, 37-6-1371, 37-6-1665, 37-6-119, 37-6-120, 38-4-714, 38-4-719, 38-4-722 and 38-4-732; refer to Table 3.1); and
- One previously recorded open artefact site that is not listed on the DECCW AHIMS register and could not be relocated (Dyall's 'Lochinvar Farley C').

Only four of the sites recorded during the present survey are located further than about 10 metres from the current investigation area (Belford Rail 14, Branxton Rail 8, Greta Rail 2 and Rutherford Rail 3).

The registered Aboriginal stakeholders did not disclose any specific knowledge of any traditional or historical cultural values/places (for example, sites of traditional cultural significance or historically known places or resource use areas). However, the possibility cannot be excluded that traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted.

6.3 Discussion

The results of the investigation are discussed below, including the potential integrity of the evidence, nature of the evidence and interpretations of the evidence.

Integrity:

The integrity of the identified sites and the remainder of the investigation area can primarily be assessed for surface evidence only through examination of land use impacts. Controlled excavation enables integrity to be assessed through the horizontal and vertical distribution of artefacts and by conjoining items.

Approximately 95.5 hectares (27%) of the 358 hectare investigation area has been extensively impacted by earthmoving works, typically associated with construction of the existing railway, such that there is negligible potential for any Aboriginal heritage evidence to survive. These areas are marked as "modified" on Appendix 1.

[6] For the previously recorded sites, given that they often extend over broad areas (that were not necessarily mapped by the recorders) and other uncertainties relating to their exact locations, 50 metres is assumed to be a zone in which evidence may occur or may extend into the present investigation area. For sites recorded during the present survey, only those directly within or extending immediately (within say 10 metres) adjacent to the investigation area border are included within this total.

The remainder of the investigation area ("unmodified investigation area") measures 262.6 hectares. However, impacts have occurred across much of this area since the time of non-indigenous settlement, from:

- Widespread removal of native vegetation;
- Pastoral activities;
- Agricultural activities;
- Rural and residential use (including houses, buildings, dams and fences);
- Construction, maintenance and use of the Main Northern Railway;
- Essential services (power, gas pipelines, telecommunications and water and sewage pipelines);
- Erosion control works (for example, contour banks, dams and drains);
- Construction, maintenance and use of roads, including well-formed roads and lightly formed or unformed vehicle tracks; and
- Other focalised impacts such as earthworks and material stockpiles.

These impacts are likely to have reduced the integrity of any artefact evidence within the unmodified investigation area, and typically removed most other forms of heritage evidence (for example, scarred trees) had they been originally present. However, relatively intact sub-surface deposits of artefacts may occur in certain contexts, where disturbance levels are lower and/or a relatively deeper A unit soil exists.

Levels of ground disturbance were recorded during the survey, after McDonald *et al* (1984) (Appendix 2). Approximately half of the sample area exhibited moderate to high levels of ground disturbance and close to half of the sample area exhibited low or low to moderate levels of disturbance. A total of 58 of the sites identified during the survey exhibited moderate to high levels of disturbance, with the remaining 23 sites low or low to moderate levels (Appendix 3).

Stone Materials:

A total of 516 lithic items were recorded during the survey, within 81 sites. These items are listed in Appendix 4 and summarised in Table 6.2. The combined lithic assemblage of the sites recorded during the present survey is dominated by silcrete (270 items or 52.3%) and to a lesser extent tuff (209 items or 40.5%), with minor frequencies of other stone materials, including chert, chalcedony, breccia, sedimentary, ironstone, quartz and quartzite.

Silcrete is a brittle, intensely indurate rock composed mainly of quartz clasts cemented by a matrix which may be well-crystallized quartz, cryptocrystalline quartz or amorphous (opaline) silica (Langford-Smith 1978:3). The texture of silcrete reflects that of the host rock and clasts may range in size from very fine grains to boulders.

Silcrete is produced by an absolute accumulation of silica, which can be precipitated from solution by evaporation, cooling, the neutralisation of strongly alkaline solutions, reaction with cations, adsorption by solids and the life-processes of organisms (Summerfield 1983:76). In weathered profiles, downward percolation of silica released through bedrock weathering and clay mineral authigenesis, together with water-table fluctuations, are suitable conditions for formation (Summerfield 1983:80).

Table 6.2: Combined stone artefact assemblage of the Aboriginal heritage sites within the analysis area recorded during the present survey.

	Stone Material									
Lithic Item Type	chalcedony	chert	ironstone	quartz	quartzite	sedimentary	silcrete	tuff	breccia	Total
bondi point							1	1		2
bondi point - preform							1	1		2
bondi point - tip								2		2
core		1			1	1	15	12		30
core fragment			1				8	7		16
flake	1	8		1		5	128	103	2	248
flake - distal		1				1	19	12		33
flake - longitudinal							4	2		6
flake - medial	1	2				1	22	21		47
flake - proximal	1	2	1				45	24		73
lithic fragment		3					21	18		42
retouched flake		2					2	6		10
retouched flake - medial							1			1
retouched flake - proximal							2			2
utilised flake							1			1
retouched utilised flake									1	1
Total	3	19	2	1	1	8	270	209	3	516

Silcrete is normally grey in colour, but can be whitish, red, brown or yellow. It shatters readily into sharp, angular pieces with a conchoidal fracture and newly broken rocks have a semi-vitreous sheen (Langford-Smith 1978:4). Silcrete was an attractive material to the local Aboriginal people because of its flaking properties and availability. Flakes have sharp, reasonably durable edges and implements made from the stone were used for a variety of tasks, including woodworking and spear barbs.

Archaeological and geological studies in the Central Lowlands region of the Hunter Valley have identified various terrestrial and alluvial sources of silcrete, including at Jerrys Plains, Singleton and terraces along the Hunter River (Raggatt 1938) and at Rothbury (Kuskie and Parkes 2002), Bengalla (Rich 1993), Saltwater Creek (Koettig and Hughes 1985), Bulga (Koettig 1994), Lemington (Brayshaw *et al* 1996, Kuskie *in prep*.), Mount Arthur North (Kuskie 2000) and other locations.

Silcrete formed a minor component of colluvial gravels present within elevated portions of the investigation area, but was typically too small to have represented a suitable source for the material. Given the availability of silcrete in the region, relatively local colluvial and/or alluvial gravel sources are inferred for the items within the investigation area. Approximately 11% of silcrete artefacts exhibited waterworn or smooth cortex, indicative of alluvial or colluvial gravel sources.

Approximately 58 (21%) of the silcrete items exhibit pink colouration and 44% of the silcrete items exhibit red colouration, which results from thermal alteration of iron oxides to haematite, and is typically indicative of thermal alteration. Deliberate thermal alteration (heat treatment) of silcrete was in widespread use in the Hunter Valley (Kuskie and Kamminga 2000) and involved controlled heating to specific temperatures and slow cooling to alter the flaking qualities. The original poorly ordered, strongly interlocking microfabric becomes more equigranular and crystallised (Domanski and Webb 1992:612). However, a proportion of the colour change (particularly the red items) may also be explained by bushfire or other forms of unintentional heating.

Tuff is a fine grained, isotropic stone formed after a cloud of ash was ejected in an explosive volcanic eruption. The ash settled to the ground or through ponded water. After burial, some tuff beds became indurated, through a low-grade metamorphic process (probably involving pressure) in which the stone recrystallised to a more stable structure. Tuff samples examined from the lower and upper Hunter are rhyolitic in chemical composition (quartz and potassium-feldspar, occasionally with layer silicate or goethite) (Kuskie and Kamminga 2000).

Tuff is typically grey in colour in the lower Hunter (a function of grain size, not a reference to individual grains, which can be of a variety of colours). However, tuff is porous enough for the diffusion of iron bearing solution, with iron precipitating out to give a yellow, brown, red or orange colour, often seen in samples from the mid to upper Hunter Valley. Variations to the surface colouration can also result from weathering processes. In the present study, many of the tuff items are in the orange - yellow - brown - red colour range, indicative of the presence of goethite.

Volcanic tuffs occur in widespread seams throughout the Hunter Valley and are occasionally exposed in drainage lines or in cliff faces, or the cobbles become worked into river gravels (for example, the Hunter River and its tributaries) where they represent a readily available source of the material. In the elevated terrain of the investigation area, tuff formed a minor component of the colluvial gravels present, although may not have represented a suitable source of the material. Other relatively local colluvial and/or alluvial gravel sources are inferred. Of the tuff artefacts, 11% exhibit waterworn cortex indicating an alluvial source, and 13% a tabular cortex that is also consistent with colluvial gravels.

Lithic items:

The combined artefact assemblage is dominated by flakes (248 items or 48% of the assemblage), flake portions (159 items or 31%), lithic fragments (42 items or 8%) and cores (30 items or 6%) and core fragments (16 items or 3% each) (refer to Table 6.2 and Appendix 4). These items may represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard.

Backed artefacts comprise a relatively small (1%) component of the assemblage, and these items include bondi points or portions and several bondi point preforms. The bondi point preforms in site Rutherford Rail 2 may represent the evidence of backed artefact production at this site. The discarded bondi points and portions at sites Greta Rail 8 and Rutherford Rail 2 may also represent evidence of the production and discard of microliths (backed artefacts).

The remainder of the assemblage comprises retouched flakes or flake portions (13 items or 2.5%), a utilised flake and a retouched utilised flake. Hence, items with use-wear comprise a very small proportion of the assemblage (0.4%). Several of the retouched flakes may relate to the backing of artefacts. Although the functions of the utilised items are uncertain, they indicate that tasks other than artefact production occurred within the investigation area. Nevertheless, in general terms, the frequency of utilised and/or retouched items within the investigation area is relatively low.

Spatial Patterning:

The spatial distribution of evidence can be examined, particularly in relation to environmental variables such as slope and landform element. However, the inferences that can be made from this comparison are limited by the nature of the sample and levels of ground disturbance.

The open artefact sites identified during the present survey within the analysis area occur on five of the seven landform units present. A total of 57 sites (70% of open artefact sites recorded during the present survey within the analysis area) occur on simple slopes, 16 on drainage depressions (20%), five on spur crests, two on flats and one on a ridge crest. Given that simple slopes comprise 64% and drainage depressions comprise 22% of the analysis area, these results are not unexpected.

In relation to class of slope, 49 (60%) of the open artefact sites occur on gentle gradients (which comprise 59% of the analysis area), 27 (33%) occur on level to very gentle gradients (which comprise 31% of the analysis area), and five occur on moderate gradients (which comprise 9% of the analysis area).

Examination of artefact counts and densities between the different landform units, classes of slope and environmental contexts (ie. combinations of landform element and class of slope; refer to Table 6.1) will remove any biases created by different conditions of archaeological visibility or different levels of survey coverage.

The artefact densities are relatively low across the investigation area (mean of 0.034 artefacts per square metre of effective survey coverage), and are even lower if site Rutherford 2 with 192 artefacts, close to Wentworth Swamps, is excluded (mean of 0.02 artefacts/m^2 of effective survey coverage). Artefact densities are very high in the ridge crest unit (1.343/m^2) due to this site. Artefact densities are relatively higher on the simple slopes (0.027/m^2), than on the spur crests (0.016/m^2), drainage depressions (0.014/m^2) and flats (0.008/m^2).

This indicates a trend for higher artefact discard on ridge crests than on the other landform units. However, these results must be treated with caution due to the nature of the artefact and effective survey coverage samples.

Examination of artefact density with respect to gradient reveals that a mean of 0.048 artefacts per square metre of effective survey coverage occurs on gentle gradients, compared with 0.020/m^2 on level-very gentle gradients and 0.008/m^2 on moderate gradients. Hence, there is a trend towards higher artefact discard on areas of gentle gradient. However, these results may be biased by the presence of the relatively large site 'Rutherford Rail 2' on the gentle ridge crest unit. Excluding this site, the mean density on gentle gradients is 0.024/m^2.

In terms of environmental contexts (combinations of landform element and class of slope; refer to Table 6.1), 33 (41%) open artefact sites identified during the present survey within the analysis area occur on gentle simple slopes, 22 (27%) on level to very gentle simple slopes and 11 (14%) on gentle drainage depressions, with four or less open sites in each of the remaining environmental contexts in which sites were identified. These results are generally consistent with the proportion that these contexts comprise of the investigation area (43% for gentle simple slopes), 15% for level to very gentle simple slopes and 13% for gentle drainage depressions (refer to Table 6.1).

Examination of artefact density (Table 6.1) reveals that the highest mean density of 8.727 artefacts per square metre of effective survey coverage occurs on the gentle ridge crest, due to the influence of the relatively large site 'Rutherford Rail 2'. Artefact densities were relatively high on the gentle spur crests (0.032/m^2), level to very gentle simple slopes (0.030/m^2) and gentle simple slopes (0.028/m^2), than in the other contexts.

Hence, the density results (based on *archaeological visibility* and *effective survey coverage*) indicate trends for relatively higher artefact discard to occur on gentle ridge crests, and to a lesser extent gentle spur crests and level to gently inclined simple slopes. In terms of landform units, the density results indicate trends for relatively higher artefact discard to occur on ridge crests, and to a lesser extent simple slopes. In terms of gradient, the density results indicate trends for relatively higher artefact discard to occur on gentle gradients and to a lesser extent level to very gentle gradients.

These results are generally consistent with the results of surveys elsewhere in the Central Lowlands region and general models of Aboriginal occupation. However, in overall terms, the evidence represents a generally low density distribution of artefacts.

Site Interpretation:

The inferences that can be made about the nature of occupation at the identified sites or elsewhere in the investigation area are limited by the nature of the sample and the levels of ground disturbance within the investigation area.

The evidence identified at many of the sites within the investigation area is consistent with background discard, manuport and artefact material which is insufficient either in number or in association with other material to suggest focused activity in a particular location (Rich 1993, Kuskie and Kamminga 2000). Several sites, notably Rutherford Rail 2 and #37-6-1339, exhibit evidence characteristic of more focused occupation, with higher artefact counts and densities and a higher range of stone material and artefact types.

The artefact evidence is inferred in part to have derived from a number of specific activity areas, although identifying those during a surface survey with limited visibility conditions is problematic. Although the vast majority of evidence represents non-specific stone flaking, evidence of microlith production, loss or intentional discard of microliths and loss or discard of non-microlith tools is present in low frequencies within the analysis area. The grinding groove site provides evidence of the production and/or maintenance of stone hatchets.

In general, it is inferred that Aboriginal occupation of the narrow linear investigation area was mostly of a low intensity, and probably related to transitory movement through the landscape and hunting/gathering by small groups of people during the course of the normal daily round. However, the evidence has clearly arisen from multiple episodes of occupation, which may have occurred over the time span of human occupation of the locality. Controlled excavation and dating of cultural deposits would be required to resolve this issue. Several sites and zones within the investigation area may also have involved encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round (for example, at Rutherford Rail 2 and #37-6-1339; refer below).

Broader models of occupation for the Hunter Valley region proposed by Kuskie and Kamminga (2000) for the lower valley and Kuskie and Clarke (2004) for the central to upper valley, based on ethnographic, ethnohistorical, oral historical and archaeological evidence, identify that *primary resource zones* with relatively more abundant and diverse resources were a focus of occupation in the region, and to a lesser extent *secondary resource zones* (refer to Section 3.4).

Portions of the investigation area (specifically, those areas close to the higher order watercourses of Stony Creek, Anvil Creek, Sawyers Creek, Black Creek, Sweetwater Creek and Jump-Up Creek, along with areas at the eastern end close to Wentworth Swamps) are located in what may be characterised as *secondary resource zones* under this model. The following survey units are approximately those located in these areas, although levels of disturbance within the investigation area in some of these units may limit the potential for the survival of evidence of more focused occupation:

- MM 12-19 and 300 around Jump-Up Creek;
- MM 64, 66-70, 73 and 74 around Sweetwater Creek;
- MM 75, 76, 81-86 and 302 around Black Creek;
- MM 114, 116-118, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185 and 303 around Anvil Creek;
- MM 130-136 around Sawyers Creek;
- MM 278-286 around Stony Creek; and
- MM 287-289, 292-294 and 296-298 adjacent to Wentworth Swamps.

This generally includes survey units within about 100 metres of the secondary resource zone, although there is insufficient empirical evidence to assess whether this distance represents an appropriate demarcation. Several areas that could not be examined due to property access constraints also lie within these zones.

Occupation of these *secondary resource zones*, in addition to hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials, probably also involved encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round. There was a preference for camping on level ground, adjacent to reliable water sources and more abundant subsistence resources. A greater range and frequency of activities were undertaken at the encampments, rather than in the surrounding landscape. Camp sites in these areas were probably occupied by these small groups of people for varying lengths of time (but of typically short duration), during both the course of the seasonal round and in different years. Occupation of these camp sites would have been predominantly sporadic, rather than continuous.

The remainder of the investigation area generally falls within the areas defined by Kuskie and Clarke (2004) that do not conform to primary or secondary resource zones. According to the modelling presented in Section 3.4, occupation of these portions of the investigation area is therefore more likely to have related to hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials, and have been of a generally low intensity. The utilisation of these areas was probably far less intense than the primary and secondary resource zones. These areas were probably typically exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones that foraged within an area of up to ten kilometres radius from their campsites (Kuskie and Clarke 2004). The open artefact sites identified within the investigation area typically conform to this pattern of occupation, but for many sites the limitations of surface visibility and small nature of the samples constrains the ability to assess this issue further.

Regional Context:

The nature of the evidence from the investigation area can be compared with other studies and sites in the region (refer to Section 3.2). The primary purpose is to identify similarities and differences with other reported evidence, in order to provide a framework for interpreting representativeness and assessing potential cumulative impacts (refer to Section 8).

Several primary similarities have been identified with other survey results in the locality (refer to Section 3.2) including the:

- Predominance of stone artefact evidence;
- Similar stone material and artefact types;
- Generally low artefact numbers and densities; and
- Presence of evidence in similar environmental contexts, including landform elements and gradients.

No specific aspects of the evidence within the investigation area appear to be unique or not replicated elsewhere within a regional context, although major high-density sites such as Rutherford Rail 2 and the grinding groove site represent less commonly reported evidence.

Reassessment of Predictive Model of Site Location:

In view of the survey results, the predictive model of site location for the unmodified investigation area (refer to Section 3.5) can be reassessed. Although about 87% of the unmodified investigation area has been sampled during this study, the model can be reassessed in relation to the 13% that has not been sampled yet, along with areas within the sampled zone that were not directly inspected.

Visual inspection confirmed that negligible potential for heritage evidence exists within the approximately 95.5 hectares (27%) of the 358 hectare investigation area that has been extensively impacted by earthmoving works, typically associated with construction of the existing railway (areas marked as "modified" in Appendix 1).

On the basis of the survey results of 87% of the unmodified investigation area, along with some adjacent areas, the potential for bora/ceremonial, carved tree, scarred tree and stone arrangement sites to occur within the portions of the investigation area that have not been directly sampled or not sampled at all due to access constraints, can be reassessed as very low or negligible.

No evidence was encountered of burial sites, and although the potential for skeletal remains to occur within the investigation area is considered to be low or very low, it cannot be discounted.

Minor areas of exposed sandstone and sedimentary bedrock were identified within the investigation area. Visible bedrock was inspected for the presence of grinding grooves, with one site identified (refer to Section 6.2). The potential for further grinding groove sites to occur can be revised downward to very low, but cannot be discounted.

No evidence was encountered of midden sites. However, the potential for older sub-surface evidence (ie. mid-late Holocene age) in close proximity to the former Hunter River estuary cannot be discounted at the eastern end of the investigation area near Wentworth Swamps, albeit the potential for survival of such evidence decreases with age due to natural post-depositional factors.

In the elevated terrain of the investigation area, colluvial gravels are common, including minor silcrete, quartz and tuff. These materials were suitable for artefact manufacture and it is possible that stone was procured by Aboriginal people from sources within the investigation area, although direct evidence of such was not identified within the sample. The potential for specific evidence of lithic quarry sites can be revised downward to low.

Sites of traditional cultural significance (such as mythological sites) were not identified by the Aboriginal representative involved in the investigation. The registered Aboriginal stakeholders also did not disclose any specific knowledge of other cultural values/places (for example, historically known places or resource use areas). However, the possibility cannot be excluded that traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted.

Stone artefact evidence has been identified within the unmodified investigation area, confirming predictions of the site location model. In overall terms, the evidence represents a generally low density distribution of artefacts, with internal trends for relatively higher artefact discard to occur on gentle ridge crests, and to a lesser extent gentle spur crests and level to gently inclined simple slopes. However, several locations of higher artefact counts and higher artefact densities have been identified.

Further artefacts are expected to occur across the unmodified investigation area in a distribution and density consistent with these results and the predictions of the occupation model, particularly in areas that were obscured by vegetation or not directly sampled during the survey, and in areas that could not be sampled at all due to access constraints (apart from areas totally impacted by recent land use, in which the potential for evidence is negligible).

On the basis of the occupation model and survey results, the potential for further artefact evidence to occur within the investigation area is assessed as follows:

- In the 'modified' areas and in other minor, localised portions of the investigation area in which the A unit soil has been totally removed, previous land use has caused such substantial impacts that there is generally negligible potential for any Aboriginal heritage evidence to survive;
- In areas of lower ground disturbance within the portions of the investigation area that may be characterised as being within *secondary resource zones*, there is a moderate to high potential for sub-surface deposits of artefacts to occur, including deposits that may be *in situ* and/or of research value. These zones include several areas that could not be examined due to access constraints, along with the following survey units (and typically also the identified Aboriginal sites located within these units; refer to detailed plans in Appendix 1):
    - MM 12-19 and 300 around Jump-Up Creek;
    - MM 64, 66-70, 73 and 74 around Sweetwater Creek;
    - MM 75, 76, 81-86 and 302 around Black Creek;
    - MM 114, 116-118, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185 and 303 around Anvil Creek;

- MM 130-136 around Sawyers Creek;
- MM 278-286 around Stony Creek; and
- MM 287-289, 292-294 and 296-298 adjacent to Wentworth Swamps.

- In the remainder of the investigation area, a low to very low density of artefacts and potentially shallow low-density sub-surface deposit of artefacts may occur at many of the identified sites and widely across these survey units, consistent with the survey results and occupation model. In general, this evidence will be consistent with background discard, and although a low frequency of activity areas (with consequent higher artefact density) may be present, will not represent focused occupation. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the unmodified investigation area is generally low. Typically this is a result of the levels of ground disturbance, the shallow, skeletal nature of the A unit soil, and the occupation model and predictive model (refer to Sections 3.4 and 3.5).

7. SIGNIFICANCE ASSESSMENT

7.1 Criteria

The information contained within this report, along with an assessment of the significance of the Aboriginal heritage evidence, provides the basis for DECCW and DoP to make informed decisions regarding the management and degree of protection which should be afforded to specific Aboriginal heritage sites.

The significance of Aboriginal heritage evidence can be assessed along the following criteria which are widely used in Aboriginal heritage management and derived from the relevant aspects of the ICOMOS Burra Charter:

- Scientific (archaeological) value;
- Importance to Aboriginal people (cultural value);
- Educational value;
- Historic value; and
- Aesthetic value.

Greater emphasis is generally placed on scientific and cultural criteria when assessing the significance of Aboriginal heritage evidence in Australia.

Scientific (Archaeological) Value:

Scientific value refers to the potential usefulness of heritage evidence to address further research questions, the representativeness of the evidence, the nature of the evidence and its state of preservation.

Research Potential:

Research potential refers to the potential for information derived from further investigation of the evidence to be used for answering current or future research questions. Research questions may relate to any number of issues concerning past human culture, human behaviour generally or the environment. Numerous locations of heritage evidence have research potential. The critical issue is the threshold level, at which the identification of research potential translates to significance/importance at a local, regional or national level.

Several key questions can be posed for each location of heritage evidence:

- Can the evidence contribute knowledge not available from any other resource?
- Can the evidence contribute knowledge, which no other such location of evidence can?
- Is this knowledge relevant to general questions about human history, past environment or other subjects?

Assessing research potential therefore relies on comparison with other evidence in local and regional contexts. The criteria used for assessing research potential include the:

a) Potential to address locally specific research questions;

b) Potential to address regional research questions;

c) Potential to address general methodological or theoretical questions;

d) Potential deposits; and

e) Potential to address future research questions.

In terms of meeting a threshold level to have significant research potential, the particular questions asked of the evidence should be able to contribute knowledge that is not available from other resources or evidence (either on a local or regional scale) and are relevant to general questions about human history, past environment or other subjects.

Representativeness:

Representativeness is generally assessed at local, regional and national levels. It is an important criterion, because the primary goal of cultural resource management is to afford greatest protection to a representative sample of Aboriginal heritage evidence throughout a region. The more unique or rare evidence is, the greater its value as being representative within a regional context.

Issues involved in assessing the value of representativeness include:

- Whether the evidence is a very good example of a type of place or period of history within a region;
- The state of preservation and integrity of the evidence;
- The educational and demonstrative potential of the evidence; and
- The vulnerability of the specific type of evidence.

Nature of Evidence:

The nature of the heritage evidence is related to representativeness and research potential. The less common the type of evidence is, the more likely it will have representative value. The nature of the evidence is directly related to its potential to be used in addressing present or future research questions. Criteria used in assessing the nature of the evidence, particularly stone artefact sites, include the:

a) Presence, range and frequency of stone materials;

b) Presence, range and frequency of artefact types; and

c) Presence and types of other features.

A broader range of stone material and artefact types generally equates to the potential for information to address a broader range of research questions. The presence of non-microlith and microlith tool types also equates to a higher potential to address relevant research questions. The presence and frequency of particular stone or artefact types or other features also has relevance to the issue of representativeness (for example, a rare type may be present).

Integrity:

The state of preservation of the evidence (integrity) is also related to representativeness and research potential. The higher the integrity of evidence, the greater the level of scientific information likely to be obtained from its further study. This translates to greater importance for the evidence within a local or regional context, as it may be a suitable example for preservation within a sample representative of the entire cultural resources of a region.

The criteria used in assessing integrity, particular for artefact sites, include:

a) Horizontal spatial distribution of artefacts;

b) Vertical spatial distribution of artefacts;

c) Preservation of intact features such as midden deposits, hearths or knapping floors;

d) Preservation of site contents such as charcoal and shell which may enable accurate direct dating or other analysis; and

e) Preservation of artefacts which may enable use-wear/residue analysis.

Generally, many of these criteria can only be applied to evidence obtained by controlled excavation. High levels of ground disturbance limit the possibility that the evidence would surpass the threshold of significance on the basis of integrity (ie. the area would be unlikely to possess intact spatial distributions, intact features, *in situ* charcoal or shell).

Aboriginal (Cultural) Significance:

Aboriginal (cultural) significance refers to the value placed upon Aboriginal heritage evidence by the Aboriginal community.

All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Heritage evidence may be part of contemporary Aboriginal culture or be significant because of its connection to spiritual beliefs or as a part of recent Aboriginal history.

Consultation with the local Aboriginal community is essential to identify the level of Aboriginal significance.

Educational Value:

Educational value refers to the potential of heritage evidence to be used as an educational resource for groups within the community.

Historic Value:

Historic value refers to the importance of heritage evidence in relation to the location of an historic event, phase, figure or activity.

Aesthetic Value:

Aesthetic value includes all aspects of sensory perception. This criterion is mainly applied to art sites or mythological sites.

7.2 Significance of Heritage Evidence Within the Analysis Area

The 96 Aboriginal heritage sites identified within the analysis area do not surpass the threshold for significance in terms of educational, historic or aesthetic value. Partially this is a result of the relatively unobtrusive nature of the evidence itself and partially due to the levels of existing impacts to the natural context of the sites.

All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Consultation with members of the local Aboriginal community was undertaken to assist with identification of the level of Aboriginal significance. Representatives of the Aboriginal stakeholders expressed their strong contemporary interest in the identified evidence and its cultural value.

In acknowledgment that the Aboriginal community themselves are in the best position to identify levels of cultural significance (refer to Section 5.2 and Appendix 6), the remainder of this assessment focuses on the potential scientific values of the heritage evidence. The statement of scientific significance is in no way intended to prioritise scientific values over cultural values or to lessen the importance of the views of the Aboriginal community. The Wanaruah and Mindaribba Local Aboriginal Land Councils have emphasized the high value of the heritage evidence to the Wonnarua Aboriginal community.

An assessment of the significance of each Aboriginal site within the analysis area is summarised in Table 10.1 and below. Within a local context, the significance of the identified sites was assessed as follows:

- Two sites as being of high significance;
- One site as being of moderate to high significance;
- One site as being of moderate significance;
- Nine sites as being of low to moderate or potentially moderate significance; and
- 83 (86%) sites as being of low significance.

Two sites, Rutherford Rail 2 and #37-6-1339 (Black Creek RTA 2), are assessed as being of high scientific significance within a local context and low (but potentially higher) scientific significance within a regional context on the basis that:

- The sites are of relatively low representative value within a regional context. Similar evidence exists elsewhere in the Hunter Valley;
- The sites exhibit a broad range of artefact and stone material types, relatively high numbers of artefacts and artefacts occur at a high density, with several less common types;
- The sites have been affected by post-depositional impacts, but generally to a low extent; and
- There is a high potential for sub-surface deposits of artefacts to occur at the sites, including deposits that may be *in situ* and/or of high research value. Further investigation of these deposits could address locally important questions regarding logistical and settlement patterns, stone artefact manufacturing technology and the organisation of stone production and distribution.

One site, Rutherford Rail 3, is assessed as being of moderate to potentially high scientific significance within a local context and low scientific significance within a regional context on the basis that:

- The site is of low representative value within a regional context. Similar evidence exists elsewhere in the Hunter Valley;
- The site exhibits a relatively limited range of artefact and stone material types but artefacts occur at a moderate to high density;
- The site has been affected by post-depositional impacts, but generally to a low extent; and
- There is a high potential for sub-surface deposits of artefacts to occur at the site, particularly in immediately adjacent areas, including deposits that may be *in situ* and/or of high research value.

One site, #37-6-1371 (PAD 20, Black Creek), is assessed as being of moderate scientific significance within a local context and low scientific significance within a regional context on the basis that:

- The site is of low representative value within a regional context. Similar evidence exists elsewhere throughout the Hunter Valley;
- The site exhibits a limited range of artefact and stone material types; and
- There is a moderate potential for sub-surface deposits of artefacts to occur at the site, including deposits that may be *in situ* and/or of some research value. The limited program of test excavation undertaken at the site (Umwelt 2006a) provides insufficient data to warrant a conclusion of low potential.

Nine sites (Allandale Rail 9, Belford Rail 13, Branxton Rail 3 and 15, Greta Rail 7, 8, 9 and 13, and Lochinvar Rail 3) are assessed as being of low to moderate or low to potentially moderate scientific significance within a local context and low scientific significance within a regional context on the basis that:

- The sites are of low representative value within a regional context. Similar evidence exists elsewhere throughout the Hunter Valley and the identified artefacts do not represent rare or unusual types;
- Several of the sites exhibit a modest range of artefact and stone material types and artefacts occur in moderate numbers and/or at a moderate density;
- The sites have been affected by post-depositional impacts, but generally to a low extent; and
- There is generally a low to moderate potential for sub-surface deposits of artefacts to occur at the sites, including deposits that may be *in situ* and/or of some research value.

The 83 sites assessed as being of low scientific significance within a local context and low scientific significance within a regional context was typically on the basis that (refer to Table 10.1):

- The sites are of low representative value within a regional context. Similar evidence exists elsewhere throughout the Hunter Valley and the identified artefacts do not represent rare or unusual types;

- The sites exhibit a limited range of artefact and stone material types and artefacts occur in low numbers;
- The sites have typically been moderately to highly affected by post-depositional impacts, and are consequently of relatively low integrity; and
- In view of the moderate to high levels of ground disturbance and typically shallow nature of the A unit soil, in combination with the occupation model (refer to Section 3.4), although further artefacts may occur in shallow sub-surface deposits, there is generally a limited potential for deposits that may be *in situ* and/or of high research value.

8. IMPACT ASSESSMENT

8.1 Impacts to the Identified and Potential Heritage Resource

The Aboriginal heritage assessment reported herein has been commissioned in relation to the Maitland to Minimbah Third Track Project. The Hunter 8 Alliance, on behalf of the ARTC, is proposing to construct a third track adjacent to the existing Main Northern Railway between Maitland and Minimbah. The Project would involve the construction of approximately 30 kilometres of new rail track, as well as construction and/or modification of major infrastructure along the Main Northern Railway. A summary of the major elements of the Project is provided in Table 1.1. A Major Project application under Part 3A of the EP&A Act has been lodged for the Project with DoP.

Approximately 262 hectares of the 358 hectare investigation area has been identified by the proponent as a zone of probable construction impacts. This encompasses much of the 95 hectare 'modified' portion of the investigation area, that has already been extensively impacted by earthmoving works. Hence, approximately 170 hectares of the 'unmodified investigation area' is anticipated to be subject to impacts from the Project. Due to the nature of anticipated earthmoving works, in the absence of mitigation measures the Project will substantially affect any heritage resources within this zone of impact.

Within the proposed zone of impact, the following conclusions are made about the probable impacts to the identified and potential heritage resources:

- 65 open artefact sites would be subject to impacts[7], including one site of high significance, eight sites of low to moderate significance and 56 sites of low significance (refer to Table 10.1);
- In the 'modified' areas and in other minor, localised portions of the proposed impact area in which the A unit soil has been totally removed, previous land use has caused such substantial impacts that there is generally negligible potential for any Aboriginal heritage evidence to survive (refer to Appendix 1);
- In areas of lower ground disturbance within the portions of the impact area that may be characterised as being within *secondary resource zones*, there is a moderate to high potential for sub-surface deposits of artefacts to occur, including deposits that may be *in situ* and/or of research value. These zones include several areas that could not be examined due to access constraints, along with the following survey units or portions thereof within the impact area:
  - MM 12-19 and 300 around Jump-Up Creek;
  - MM 64, 66, 67, 69, 70, 73 and 74 around Sweetwater Creek;
  - MM 75, 76, 81-84 and 86 around Black Creek;
  - MM 114, 116-118, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185 and 303 around Anvil Creek;
  - MM 130-132 and 134-136 around Sawyers Creek;

[7] Of these 65 open artefact sites, 55 would almost certainly be subject to total impacts, seven probably total impacts and three partial impacts. Thirty open artefact sites and one grinding groove site identified within the analysis area will not be subject to impacts (refer to Table 10.1).

- MM 278-281 and 283-286 around Stony Creek; and
- MM 287-289, 292-294 and 296 adjacent to Wentworth Swamps.

- In the remainder of the impact area, a low to very low density of artefacts and potentially shallow low-density sub-surface deposit of artefacts may occur at many of the 65 identified sites and widely across the survey units, consistent with the survey results and occupation model. In general, this evidence will be consistent with background discard, and although a low frequency of activity areas (with consequent higher artefact density) may be present, will not represent focused occupation. The potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the unmodified impact area is generally low;
- The potential for bora/ceremonial, carved tree, scarred tree and stone arrangement sites to occur within the unmodified portions of the impact area that have not been directly sampled or were not sampled at all due to access constraints, is assessed as very low or negligible;
- The potential for burial sites to occur within the unmodified portions of the impact area is assessed as low or very low but cannot be discounted;
- The potential for shell midden evidence to occur within the unmodified portions of the impact area is assessed as very low, but cannot be discounted in the eastern end near Wentworth Swamps;
- The potential for grinding groove sites to occur within the unmodified portions of the impact area is assessed as very low but cannot be discounted;
- The potential for specific evidence of lithic quarry sites to occur within the unmodified portions of the impact area is assessed as low; and
- Sites of traditional or historical cultural significance have not been identified within the impact area, however the possibility cannot be excluded that such values or associations may exist that were not divulged by the persons consulted.

A total of 32.9 hectares of the investigation area could not be sampled during the archaeological survey. This represents 13% of the total unmodified investigation area, and includes areas both within and outside of the proposed zone of impact.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the project on Aboriginal heritage will be high within a local context, but relatively low within a regional context.

8.2 Cumulative Impacts

An objective of the NP&W Act (Section 2A{1}) is the "conservation of objects, places or features … of cultural value within the landscape, including, but not limited to … places, objects and features of significance to Aboriginal people …". This objective is to be achieved by applying the principles of ecologically sustainable development (Section 2A{2}), defined in Section 6 of the *Protection of the Environment Administration Act 1991* as requiring the integration of *economic* and *environmental* considerations (including cultural heritage) in the decision-making process. In regard to Aboriginal cultural heritage, ecologically sustainable development can be achieved by applying the principle of intergenerational equity and the precautionary principle (DECC 2009b).

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. In terms of Aboriginal heritage, intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region (for example, because of impacts under previous AHIPs), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places. Information about the integrity, rarity or representativeness of the Aboriginal objects and places proposed to be impacted, and how they illustrate the occupation and use of land by Aboriginal people across the region, are therefore relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of a proposal (DECC 2009b:26).

The precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In applying the precautionary principle, decisions should be guided by (DECC 2009b:26):

- A careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- An assessment of the risk-weighted consequences of various options.

The precautionary principle is relevant to DECCW's consideration of potential impacts to Aboriginal cultural heritage where:

- The proposal involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted (DECC 2009b:26).

Where this is the case, DECCW instructs that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to the objects/place (DECC 2009b).

Hence, the extent to which the heritage resource present within the investigation area may exist elsewhere in the region is therefore highly relevant to an assessment of the potential impacts of the Project with respect to the principles of ecologically sustainable development, intergenerational equity and the precautionary principle, along with the significance assessment of the sites (representative value) and an assessment of the cumulative impacts of the Project.

Two avenues of inquiry can be pursued, as to whether similar heritage resources to those identified within the impact area exist elsewhere within the region:

1) By comparison of the *identified resource* with other heritage studies in the region and known site databases (refer to Sections 3.1 and 3.2); and
2) By examination of topographic mapping and aerial photographs to identify if comparable environmental contexts exists elsewhere in the region, in which a similar *potential resource* may occur.

The identified heritage resource of the investigation area has been analysed in a regional context in Section 6.3. No specific aspects of the evidence within the investigation area appear to be unique or not replicated elsewhere within a regional context, although major high-density sites such as Rutherford Rail 2 and the grinding groove site represent less commonly reported evidence. Impacts will be avoided to part of site Rutherford Rail 2 and all of the only other site assessed as being of high significance (#37-6-1339, Black Creek RTA 2).

As a result of the limited extent of archaeological sub-surface investigations undertaken to date within the region, the vast majority of the regional heritage resource represents a potential resource, which although not yet identified and recorded, almost certainly exists in consideration of predictive models of site location, the environmental contexts present, and the results of existing studies.

Topographical mapping and aerial photographs can be used to prepare a preliminary assessment, as suitable quantitative baseline data is absent. Within the mid to lower Hunter Valley region of the Central Lowlands, it is possible that focalised impacts (areas in which heritage is unlikely to survive, such as urban areas, mines and roads) may have affected around 5-15% of the region. Other non-focalised land use impacts (such as agricultural, pastoral and forestry uses) may have affected around 80-95% of the region. Areas specifically reserved for conservation (for example, National Parks, Nature Reserves and registered conservation zones) probably amount to less than 5% of the region.

It is apparent from examination of the Greta and Maitland topographical maps that similar environmental contexts to the present investigation area do exist, both in areas immediately adjacent to the investigation area, and further afield. The results of the present survey within areas immediately adjacent to (but outside of) the investigation area provides data in support of this conclusion. Similar heritage resources are also known and anticipated to occur in these areas and will not be affected by the present project.

Hence, it is concluded on the basis of the factors discussed above, along with the often moderate to high levels of existing impacts within the proposed impact area, the generally low significance of the identified evidence within the proposed impact area, and the absence of any regionally representative values of the identified evidence, that the cumulative effect of the Project on the identified and potential Aboriginal heritage resources of the region will be relatively low.

9. POTENTIAL MITIGATION AND MANAGEMENT STRATEGIES

Strategies for the management of the identified and potential Aboriginal heritage resources within the investigation area are presented below. A key consideration in selecting suitable strategies is the recognition that Aboriginal heritage is of primary importance to the local Aboriginal community, and that decisions about the management of the sites should be made in consultation with the registered Aboriginal stakeholders. The recommended strategies are presented in Section 10.

9.1 Strategy A - Further Investigation

In circumstances where an Aboriginal site is identified (particularly an open artefact site, rock shelter or shell midden), but the extent of the site, the nature of its contents, its level of integrity and/or its level of significance cannot be adequately assessed solely through surface survey (generally because of conditions of low surface visibility or sediment deposition), sub-surface testing may be an appropriate strategy to further assess the site. Testing is also appropriate in locations where artefact deposits are predicted to occur through application of a predictive model of site location (for example, PADs in rock shelters or in open contexts), in order to identify whether such deposits exist and their nature, extent, integrity and significance.

Test excavations can take the form of auger holes, shovel pits, mechanically excavated trenches or surface scrapes. A Section 87 AHIP is generally required from DECCW to undertake sub-surface testing. DECCW determination of permit applications is guided by the DECC (2009a) policy *Guide to Determining and Issuing Aboriginal Heritage Impact Permits.* Typically, approval of a Section 87 AHIP can take up to eight weeks, following receipt by DECCW of all necessary information. A research design specifying the aims and methods is an essential component of an AHIP application and therefore requires DECCW approval. The application must also comply with the relevant DECCW Aboriginal consultation policy.

However, under Part 3A Major Project amendments to the EP&A Act (Section 75U{4}), a Section 87 AHIP is generally not required for the investigation of artefact deposits where the investigation is being undertaken for the purpose of complying with environmental assessment requirements issued in connection with an application for approval to carry out a project or for a concept plan for a project.

This is a pro-active strategy, which should result in the identification, assessment and management of the Aboriginal heritage resource prior to any development activity occurring. Following assessment of each Aboriginal site, management strategies as outlined below (B - E) can be applied.

Several other aspects of the potential heritage resource may require consideration as to whether further investigation is necessary as part of the environmental assessment stage or post-approval stage. These include areas that were not sampled during the assessment (for example, due to property access restrictions) or for which subsequent design changes have occurred, in which future field inspection may be required. Typically, small areas or modifications can satisfactorily be addressed in a post-approval management plan.

In relation to the majority of the impact area, the requirement for further investigation by sub-surface testing is limited by:

- The widespread and often moderate to high levels of existing ground disturbance;
- The results of the survey, indicating a generally low to very low density of artefact evidence within these portions of the investigation area;
- The shallow, skeletal nature of the A unit soil within many of these portions of the investigation area;
- The model of Aboriginal occupation for the locality, supported by the survey results, indicating that Aboriginal occupation of these portions of the investigation area was probably of a low intensity, related to transitory movement through the landscape and hunting/gathering by small groups of people during the course of the normal daily round; and
- The consequent generally low potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value within these portions of the investigation area.

In relaton to the portions of the impact area that are characterised as being within *secondary resource zones*, wherein there is a moderate to high potential for sub-surface deposits of artefacts to occur, including deposits that may be *in situ* and/or of research value in areas of lower ground disturbance, further investigation may be warranted to identify if such deposits exist, and their nature and significance. These zones include several areas that could not be examined due to access constraints, along with the following survey units or portions thereof within the impact area (refer to detailed plans in Appendix 1):

- MM 12-19 and 300 around Jump-Up Creek;
- MM 64, 66, 67, 69, 70, 73 and 74 around Sweetwater Creek;
- MM 75, 76, 81-84 and 86 around Black Creek;
- MM 114, 116-118, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185 and 303 around Anvil Creek;
- MM 130-132 and 134-136 around Sawyers Creek;
- MM 278-281 and 283-286 around Stony Creek; and
- MM 287-289, 292-294 and 296 adjacent to Wentworth Swamps.

However, the imperative for sub-surface testing of these areas is limited by:

- The model of Aboriginal occupation for the locality, which indicates that similar potential resources will remain unaffected by the Project in adjacent areas of the same environmental contexts; and
- The limited potential to implement alternative management strategies for any heritage evidence that is identified (ie. relocation of the rail infrastructure).

As such, sub-surface test excavation is unlikely to add significantly to this assessment and on this basis is not considered to be warranted. The potential impacts of the Project can be adequately addressed through other measures (refer to Section 9.3).

The potential for skeletal remains is assessed as low or very low and on this basis further investigation is not warranted.

A number of portions of the investigation area were not sampled (totalling 32.9 hectares or 13% of the unmodified investigation area). Once property access becomes available, survey is warranted for all of these areas within the proposed zone of impact, prior to any impacts occurring, using the same methodology as for the present investigation in consultation with the registered Aboriginal stakeholders.

9.2 Strategy B - Conservation

The suitability of conservation as a management option has long been recognised. This strategy is suitable for all heritage sites, but particularly those of high archaeological significance and/or high cultural significance. Conservation is also highly appropriate for specific archaeological resources and environmental/cultural contexts, as part of a regional strategy aimed at conserving a representative sample of identified and potential heritage resources.

Options exist within development proposals that can be utilised for the conservation of identified or potential Aboriginal heritage resources, including exclusion of development from zones of high heritage significance or potential, preservation of areas within formal conservation zones, or re-routing linear impact zones (for example, pipelines or roads) or relocating minor surface infrastructure to avoid identified sites of significance

In relation to the impact area, the imperative for implementing formal conservation measures for Aboriginal heritage is limited by the factors discussed in Section 9.1, including:

- The widespread and generally moderate to high levels of existing ground disturbance;
- The generally low potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value (apart from in survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303);
- The limited representative value and low scientific significance of the identified heritage evidence within the impact area (with the exception of one site of moderate or higher significance that may be subject to impacts, Rutherford Rail 2); and
- The low cumulative impacts of the proposal.

Nevertheless, where impacts can be avoided to identified heritage evidence, appropriate precautionary measures (such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, along with temporary protective fencing and signage) can be implemented.

In relation to site Rutherford Rail 2, alternative construction options could be sought in order to minimise impacts to the identified site and associated potential resource.

In relation to the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303), consideration could also be given to avoiding or minimising the extent of impacts where feasible.

9.3 Strategy C - Mitigated Impact (Salvage)

In circumstances where an Aboriginal site may be of moderate or high significance within a local context, but the options for conservation are limited and the surface collection of artefacts or excavation of deposits could yield benefits to the Aboriginal community and/or the archaeological study of Aboriginal occupation, the strategy of salvage can be considered. Salvage in these circumstances may include the collection of surface artefacts and/or systematic excavation of artefact deposits, as part of a Section 90 AHIP obtained from DECCW or a Part 3A Major Project Approval obtained from the Department of Planning.

The imperative for such salvage measures can be assessed in relation to:

- The nature of the identified and expected evidence, its significance and its research potential (ie. the potential for salvage to provide additional, useful evidence that will enhance the overall understanding of the nature of human occupation in the locality);
- The views of the Aboriginal stakeholders, as salvage may be warranted to minimise the impacts of development on the cultural values of the evidence; and
- The extent of potential development impacts on particular sites or potential resources.

Salvage of other site types may also be warranted, for example scarred trees or grinding grooves. Salvage of a scarred tree may involve cutting and removing the tree or the portion of the tree containing the scar. Similarly, grinding grooves may be salvaged by removal of the freestanding rock they are situated on, or in the case of grooves on open bedrock, cutting and removing the section of bedrock with the grooves.

This strategy is the primary means of minimising impacts to Aboriginal heritage from development where the option of conservation is not feasible.

DECCW determination of Section 90 AHIP applications is guided by the DECC (2009a) policy *Guide to Determining and Issuing Aboriginal Heritage Impact Permits*. Typically, approval of a Section 90 AHIP can take up to eight weeks, following receipt by DECCW of all necessary information. A research design specifying the aims and methods is an essential component of an AHIP application and therefore requires DECCW approval. The application must also comply with the relevant DECCW Aboriginal consultation policy.

In relation to the investigation area, given the presence of identified Aboriginal objects protected under the *National Parks and Wildlife Act 1974*, either a Section 90 AHIP or Part 3A Approval is required prior to any impacts occurring to those objects.

In relation to the existing identified surface evidence which may be subject to partial or total impacts (65 open artefact sites), systematic collection by Aboriginal community representatives and a qualified archaeologist of this evidence may serve to partially mitigate the impacts of development on the cultural values of this evidence. This strategy could also be applied to any further surface artefact evidence that may be identified prior to construction (for example, during surveys of areas that were not sampled due to access constraints) or during construction works.

Specific mitigation measures for individual sites are listed in Table 10.1, along with a summary of the rationale. In relation to the identified sites that may be subject to impacts, in addition to surface collection the following mitigation measures are also warranted:

- For three sites (Branxton Rail 3, Greta Rail 7 and Greta Rail 8), localised hand excavation is also warranted to mitigate impacts and investigate and salvage potential deposits or features of research value;
- For four sites (Branxton Rail 15, Greta Rail 9, Greta Rail 13 and Lochivar Rail 3), surface scrapes accompanied by localised hand excavation of any features of significance that are identified is also warranted to mitigate impacts and investigate and salvage potential deposits or features of research value; and
- For one site (Rutherford Rail 2), of high significance, broad area hand excavation in addition to surface scrapes accompanied by localised hand excavation of any features of significance that are identified, is also warranted to mitigate impacts and investigate and salvage potential deposits or features of research value.

In relation to the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303), salvage measures may be warranted to further investigate and mitigate the impacts of the Project on these potential resources. Salvage may also be warranted for a sample of the areas where a typically shallow low-density deposit is anticipated to occur and the potential for deposits that may be *in situ* and/or of high research value is generally low, in order to enable any uncertainty regarding the existence and integrity of any deposits to be resolved. Salvage would also permit any evidence identified to be retrieved for curation by the Aboriginal community and analysed with respect to relevant research questions.

A suitable methodology for the investigation of these areas may involve, prior to any development impacts occurring, the conduct of mechanical surface scrapes in a sample of these areas within the impact zone, along with the localised hand excavation of any features of significance that are identified. This would enable the broader nature of the spatial distribution of any evidence to be identified with respect to the different environmental contexts, collection of identified artefacts, and the inspection for, identification of, and salvage prior to development impact of any significant, unexpected or unusual features (for example, activity areas).

A sample could be devised for the surface scrapes that encompasses portions of the different environmental contexts that will be subject to development impacts (refer to Table 6.1 and Appendix 2), focusing on the areas of lower ground disturbance within the zones of moderate or high potential (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303).

The procedures for mechanical surface scrapes could involve a dozer or similar machinery being used to systematically expose the surface within the designated sample area by progressively removing thin layers (for example, two to five centimetres) of soil. After each layer is removed, the surface could be inspected on foot and any visible evidence collected.

Where features of potential significance or research value (for example, *in situ* hearths or dense artefact clusters representative of activity areas) are identified within the surface scrapes, hand excavations could occur to retrieve the evidence that comprises the feature. For many artefact clusters, this may involve excavation by hand of one or more contiguous one square metre units, with deposits sieved and cultural materials retained for analysis. Suitable samples could be retrieved and subject to radiometric dating where appropriate. Similar procedures could apply for the localised hand excavations warranted at sites Branxton Rail 3, Greta Rail 7 and Greta Rail 8) and for the broad-area hand excavation warranted at site Rutherford Rail 2, although in the latter site, excavation of a broader area would be required to mitigate the impacts of the Project and address relevant research questions.

All lithic items retrieved could be inspected under a low-magnification microscope, which would assist in accurate identification of stone materials, artefact types, use-wear, retouch and other attributes. Individual items of significance could be photographed and/or illustrated. Curation of the recovered evidence would need to be resolved with the Aboriginal stakeholders, potentially with a Care Agreement application being lodged under Section 85A of the NP&W Act. Additional analysis, such as radiometric dating of charcoal samples may also be required. Reporting would need to occur to DECCW standards.

9.4 Strategy D - Unmitigated Impact

The strategy of unmitigated impact involves the proponent causing impacts to the heritage resource without any mitigation measures. This strategy is typically suitable when the heritage evidence is of low scientific significance, the relevant Aboriginal stakeholders hold no objections, and it is unfeasible to implement any other strategy.

Typically a Section 90 AHIP is required from DECCW prior to any impacts occurring to any identified Aboriginal objects (even isolated stone artefacts). DECCW determination of Section 90 AHIP applications is guided by the DECC (2009a) policy *Guide to Determining and Issuing Aboriginal Heritage Impact Permits.* The Section 90 AHIP must normally be obtained prior to the commencement of works affecting the evidence, because all objects are protected under the terms of the *National Parks and Wildlife Act 1974*. Alternatively, if a Part 3A Approval is granted, a Section 90 AHIP may not be required, but i*n lieu* a Statement of Commitments outlining proposed heritage management measures must be approved by the Department of Planning and implemented.

In relation to the investigation area, given the presence of identified Aboriginal objects protected under the *National Parks and Wildlife Act 1974*, either a Section 90 Consent or Part 3A Approval is required prior to any impacts occurring to those objects. In view of the factors discussed in preceding sections, unmitigated impact would only represent a feasible strategy for the management of the identified and potential heritage evidence if agreed to by the Aboriginal stakeholders and DECCW.

9.5 Strategy E - Monitoring

An alternative strategy for zones where archaeological deposits are predicted to occur (for example, survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303) is to monitor construction, particularly any initial earthmoving and soil removal works, for the presence of artefacts, shell or skeletal remains.

Monitoring is one of the primary strategies for managing the possible occurrence of Aboriginal skeletal remains. Monitoring for the presence of shell and stone artefacts is also often of value to the Aboriginal community, who may be seeking to identify and salvage material that was not visible on the surface during a preliminary study. The sieving of graded deposits is also a practical measure that enhances the benefits of monitoring for artefacts. However, the nature of construction methods (for example, the use of earthmoving machinery to rapidly excavate large quantities of soil) tends to severely limit the potential for successful identification of heritage evidence during monitoring.

Monitoring for artefacts (in preference to controlled excavation) is not a widely accepted method within the context of a scientific investigation, because it could result in substantial and costly delays to construction (particularly if a Section 90 AHIP or Part 3A Approval is not in force), late revisions to development plans, and/or cause undesirable impacts to sites of cultural or scientific significance. However, monitoring for the presence of artefacts and other features during initial earthworks can be of some benefit, by enabling the identification and retrieval of cultural evidence that may not otherwise have been recorded or salvaged.

In relation to the impact area, considering the low potential for skeletal remains, monitoring is not required for this purpose. The nature of construction methods (use of earthmoving machinery to rapidly excavate large quantities of soil without scientifically appropriate spatial control) tends to severely limit the potential for successful identification of heritage evidence during monitoring of such work. As such, the mitigation measures proposed in Section 9.3 would enable far more satisfactorily management of the potential impacts of the Project on the identified and potential heritage resource, and additional monitoring or monitoring *in lieu* of these measures, is not warranted.

10. RECOMMENDATIONS

The Aboriginal heritage assessment reported herein has been commissioned in relation to the Part 3A Major Project application lodged by the Hunter 8 Alliance, on behalf of the ARTC, for the construction of a third track adjacent to the existing Main Northern Railway between Maitland and Minimbah. The Project would involve the construction of approximately 30 kilometres of new rail track, as well as construction and/or modification of major infrastructure along the Main Northern Railway.

The Project is anticipated to result in impacts to identified and potential heritage resources across approximately 170 hectares of the 'unmodified investigation area', including (refer to Table 10.1 and Appendix 1):

- 65 open artefact sites, comprising one site of high significance, eight sites of low to moderate significance and 56 sites of low significance;
- Zones in which there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303);
- In 'modified' areas and in other minor, localised portions of the proposed impact area in which the A unit soil has been totally removed, there is generally negligible potential for any Aboriginal heritage evidence to survive;
- In the remainder of the unmodified impact area, a low to very low density of artefacts and potentially shallow low-density sub-surface deposit of artefacts that may occur widely across this area, consistent with the survey results and occupation model. In general, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value to occur within these portions of the unmodified impact area is low; and
- Other types of heritage evidence are not anticipated to occur within the impact area and other traditional or historical Aboriginal cultural values or associations have not been identified during the course of the assessment.

A total of 32.9 hectares of the investigation area could not be sampled during the archaeological survey. This represents 13% of the total unmodified investigation area, and includes areas both within and outside of the proposed zone of impact.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the Project on Aboriginal heritage will be high within a local context, but relatively low within a regional context.

The following management and mitigation measures are proposed, with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the survey and consultation with the local Aboriginal community:

- Provisions relating to Aboriginal heritage should be included in an Aboriginal Heritage Management Plan (AHMP) for the Project. These provisions should be formulated in consultation with the registered Aboriginal stakeholders that responded to the draft report and sought further involvement in the Project and DECCW and specify the policies and actions required to manage the potential impacts of the Project on Aboriginal heritage after Part 3A Approval is granted. The AHMP will comprise detail that, subject to Part 3A Project Approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Aboriginal Heritage Impact Permit. The primary elements of the AHMP are outlined below:

  - In order to mitigate the impacts of development and to retrieve and conserve samples of evidence, a program of salvage should be undertaken within the development impact area. This should involve representatives of the registered Aboriginal stakeholders that sought further involvement and qualified archaeologists implementing the following measures:

    - Management strategies for individual sites as outlined in Table 10.1;

    - Systematically collecting stone artefacts from the identified Aboriginal sites that may be subject to impacts, prior to any development impacts occurring (including from any further open artefact sites that may be identified prior to or during construction);

    - Conducting localised hand excavation at sites Branxton Rail 3, Greta Rail 7 and Greta Rail 8, prior to any development impacts occurring;

    - Conducting mechanical surface scrapes at sites Branxton Rail 15, Greta Rail 9, Greta Rail 13 and Lochinvar Rail 3, accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Conducting broad-area hand excavation at site Rutherford Rail 2, followed by surface scrapes and localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Conducting mechanical surface scrapes within a sample of the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303), accompanied by localised hand excavation of any features of significance that are identified, prior to any development impacts occurring;

    - Curation of any collected heritage evidence in an appropriate manner, as determined in consultation with the registered Aboriginal stakeholders and DECCW during preparation of the AHMP. Application would be required to DECCW under Section 85A of the NP&W Act for the curation of any salvaged items that are removed from any heritage site. Temporary storage of items at locations off-site (for example, during analysis and recording) should be allowed;

    - Analysing the collected evidence and preparing a report detailing the results of the mitigation measures consistent with the DECCW *Aboriginal Heritage Standards and Guidelines Kit* (1997), Project Approval and AHMP. The report should be provided to relevant stakeholders (such as DECCW and the Aboriginal community) within appropriate timeframes;

- Site records should be lodged in a timely manner with DECCW for any previously unrecorded Aboriginal heritage evidence that is identified within the Project area during the course of operations and further heritage assessments, and for any evidence that is salvaged under the AHMP;

- Where impacts will be avoided to the identified heritage evidence, appropriate precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, along with temporary protective fencing and signage, should be implemented for those sites within close proximity of the area of works;

- Consideration should be given to avoiding or minimising impacts to site Rutherford Rail 2 and the zones where there is a moderate or high potential for sub-surface deposits of artefacts that may be *in situ* and/or of high research value in areas of lower ground disturbance (survey units or portions thereof within the impact area of MM 12-19, 64, 66, 67, 69, 70, 73-76, 81-84, 86, 114, 116-118, 130-132, 134-136, 144, 146-148, 150, 154, 156, 158-160, 162, 164-168, 172, 173, 179-181, 184, 185, 278-281, 283-289, 292-294, 296, 300 and 303);

- As a general principle, all relevant contractors and staff engaged on the Project should receive heritage awareness training prior to commencing work on-site, including information about the Aboriginal culture and history of the locality, nature of the identified and potential Aboriginal heritage evidence within the Project area, heritage management measures and protocols, and legal obligations. The training package should be formulated in consultation with the registered Aboriginal stakeholders that sought further involvement;

- Archaeological survey should be conducted to sample all of the potential impact areas that could not be sampled during the present investigation (refer to Appendix 1) or any subsequent amendments to the impact area outside of the present investigation area. The survey should be conducted in consultation with the registered Aboriginal stakeholders using the same methodology as for the present investigation, prior to any impacts occurring. Subsequent to the survey, management strategies should be implemented as outlined in the AHMP for any previously unrecorded sites that may be identified;

- Provisions should be included to guide the management of any previously unrecorded Aboriginal heritage sites that may be identified within the Project area, *in lieu* of a Section 90 AHIP. Management provisions would vary in relation to the nature of any evidence identified, its significance and the nature of the proposed impacts, and may include temporary protection, avoidance of impacts, mitigation, monitoring or unmitigated impact;

- Should any skeletal remains be detected during the course of development, work in that location would need to cease immediately and the finds be reported to the appropriate authorities, including the Police, DECCW and Aboriginal stakeholders. Subject to the Police requiring no further involvement, if development impacts cannot be avoided, any Aboriginal skeletal remains identified should be retrieved by hand excavation and reburied outside of the impact zone at a location agreed to by the Aboriginal stakeholders;

- Archaeological investigations should only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholders that sought further involvement, and occur prior to any development impacts occurring to those specific areas or sites. These stakeholders should be afforded the opportunity to be involved in any field studies as per the DECC (2004) *Interim Community Consultation Requirements for Applicants* policy;

- The AHMP should be regularly verified to establish that it is functioning as designed to the standard required. This will involve review of the plan to identify the degree to which the policy objectives are being met, the suitability of the actions in terms of addressing the policy objectives, the quality of performance of the actions, and any additional policies or actions or modifications to existing policies or actions that may be required to enable better functioning of the plan;

- Under the terms of the *National Parks and Wildlife Act 1974* it is an offence to knowingly destroy, damage or deface an Aboriginal object without obtaining the prior written permission of the Director-General of DECCW. Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report and marked on Appendix 1, in the absence of a valid Section 90 AHIP or *in lieu*, Part 3A approval;

- Single copies of this report should be forwarded to the registered Aboriginal stakeholders; and

- Three copies of this report should be forwarded to:

  Manager
  North Branch
  Climate Change and Environment Protection Group
  Department of Environment, Climate Change and Water (NSW)
  Locked Bag 914
  Coffs Harbour NSW 2450.

After implementation of these management and mitigation measures, it is concluded that the risk of residual impacts to Aboriginal heritage from the Project will be relatively low.

Table 10.1: An assessment of the significance of each Aboriginal site within the analysis area, the potential impacts of the Project and appropriate management strategies.

Notes:

- Table includes all 96 identified Aboriginal sites within the analysis area;
- Significance assessment and criteria - refer to Section 7.2 of report for discussion.

  ***Green Shading** = low significance*
  ***Orange Shading** = low-moderate or moderate significance*
  ***Red Shading** = moderate-high or high significance*

- Potential impacts - Refers to the nature of potential impacts prior to the implementation of the recommended management strategy (ie. after implementation of the management strategy, the level of proposed impacts will be reduced for many sites);

  ***Green Shading** = no impacts proposed*
  ***Orange Shading** = partial impacts proposed*
  ***Red Shading** = total impacts proposed or probable*

- Appropriate management strategy and rationale - refer to Sections 9 and 10 of report for discussion.

  ***Green Shading** = no action/unmitigated impact*
  ***Orange Shading** = protective measures required to ensure impacts avoided*
  ***Red Shading** = further action (investigation/mitigation) required*

Site Name	Site Type	Significance Assessment	Criteria for Significance Assessment	Potential Impacts	Appropriate Management Strategy	Rationale for Management Strategy
Allandale Rail 1	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Allandale Rail 2	artefact scatter	low	common; low potential	probably total	surface collection	mitigate impacts
Allandale Rail 3	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Allandale Rail 4	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Allandale Rail 5	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Allandale Rail 6	isolated artefact	low	common; low potential	total	surface collection	mitigate impacts
Allandale Rail 7	artefact scatter	low	common; low potential	probably total	surface collection	mitigate impacts
Allandale Rail 8	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 9	artefact scatter	low-moderate	common; low potential; modest range and quantity of evidence	probably total	surface collection	mitigate impacts
Allandale Rail 10	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 11	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 12	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Allandale Rail 13	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Allandale Rail 14	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 15	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 16	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 17	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 18	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Allandale Rail 19	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts

Site Name	Site Type	Significance Assessment	Criteria for Significance Assessment	Potential Impacts	Appropriate Management Strategy	Rationale for Management Strategy
Allandale Rail 20	isolated artefact	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Allandale Rail 21	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Belford Rail 1	isolated artefact	low	common; low potential; low integrity	total	surface collection (already conducted under Stage 1 Part 3A approval - further action not required)	mitigate impacts
Belford Rail 2	artefact scatter	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 3	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Belford Rail 4	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Belford Rail 5	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 6	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 7	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 8	isolated artefact	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 9	isolated artefact	low	common; low potential	total	surface collection	mitigate impacts
Belford Rail 10	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Belford Rail 11	isolated artefact	low	common; low potential	total	surface collection	mitigate impacts
Belford Rail 12	isolated artefact	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 13	artefact scatter	low-moderate	common; moderate potential; modest density of evidence	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 14	artefact scatter	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Belford Rail 15	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Branxton Rail Grinding Groove 1	grinding groove	low	not particularly common; but low potential, only single groove, low representative value	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 1	artefact scatter	low	common; low potential; low integrity	partial	surface collection	mitigate impacts
Branxton Rail 2	artefact scatter	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 3	artefact scatter	low-moderate	common; moderate potential; modest density of evidence	total	surface collection and localised hand excavation	mitigate impacts, investigate potential deposits and features of research value
Branxton Rail 4	artefact scatter	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 5	isolated artefact	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 6	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 7	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 8	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 9	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Branxton Rail 10	isolated artefact	low	common; low potential; low integrity	probably total	surface collection	mitigate impacts
Branxton Rail 11	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 12	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Branxton Rail 13	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Branxton Rail 14	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts

Site Name	Site Type	Significance Assessment	Criteria for Significance Assessment	Potential Impacts	Appropriate Management Strategy	Rationale for Management Strategy
Branxton Rail 15	artefact scatter	low-potentially moderate	common; low to moderate potential; low to moderate density of evidence	total	surface collection and surface scrapes with localised hand excavation of features of significance	mitigate impacts, investigate potential deposits and features of research value
Branxton Rail 16	isolated artefact	low	common; low integrity	total	surface collection	mitigate impacts
Greta Rail 1	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Greta Rail 2	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Greta Rail 3	artefact scatter	low	common; low integrity	total	surface collection	mitigate impacts
Greta Rail 4	artefact scatter	low	common; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned
Greta Rail 5	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Greta Rail 6	isolated artefact	low	common; low integrity	total	surface collection	mitigate impacts
Greta Rail 7	artefact scatter	low-moderate	common; moderate potential; modest density of evidence	partial	surface collection and localised hand excavation	mitigate impacts, investigate potential deposits and features of research value
Greta Rail 8	artefact scatter	low-moderate	common; moderate potential; modest range and density of evidence	total	surface collection and localised hand excavation	mitigate impacts, investigate potential deposits and features of research value
Greta Rail 9	artefact scatter	low-potentially moderate	common; low to moderate potential	total	surface collection and surface scrapes with localised hand excavation of features of significance	mitigate impacts, investigate potential deposits and features of research value
Greta Rail 10	artefact scatter	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
Greta Rail 11	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Greta Rail 12	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Greta Rail 13	artefact scatter	low-potentially moderate	common; low to moderate potential	total	surface collection and surface scrapes with localised hand excavation of features of significance	mitigate impacts, investigate potential deposits and features of research value
Greta Rail 14	artefact scatter	low	common; limited range and quantity of evidence	total	surface collection	mitigate impacts
Greta Rail 15	artefact scatter	low	common; limited range and quantity of evidence	total	surface collection	mitigate impacts
Greta Rail 16	artefact scatter	low	common; low integrity; limited range and quantity of evidence	total	surface collection	mitigate impacts
Greta Rail 17	artefact scatter	low	common; limited range and quantity of evidence	total	surface collection	mitigate impacts
Greta Rail 18	artefact scatter	low	common; limited range and quantity of evidence	nil	protective measures to ensure impacts avoided	no direct impacts planned
Greta Rail 19	isolated artefact	low	common; limited range and quantity of evidence	total	surface collection	mitigate impacts
Lochinvar Rail 1	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Lochinvar Rail 2	artefact scatter	low	common; low potential	total	surface collection	mitigate impacts
Lochinvar Rail 3	artefact scatter	low-potentially moderate	common; low to moderate potential	total	surface collection and surface scrapes with localised hand excavation of features of significance	mitigate impacts, investigate potential deposits and features of research value
Lochinvar Rail 4	isolated artefact	low	common; low integrity	total	surface collection	mitigate impacts
Rutherford Rail 1	isolated artefact	low	common; low integrity	total	surface collection	mitigate impacts
Rutherford Rail 2	artefact scatter	high	high potential; broad range and high density of evidence; several less common types	partial	surface collection; broad area hand excavation; surface scrapes with localised hand excavation of features of significance	mitigate impacts, investigate potential deposits and features of research value
Rutherford Rail 3	artefact scatter	moderate to potentially high	high potential; moderate density of evidence	nil	protective measures to ensure impacts avoided	no direct impacts planned

Site Name	Site Type	Significance Assessment	Criteria for Significance Assessment	Potential Impacts	Appropriate Management Strategy	Rationale for Management Strategy
Station Lane 1	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Station Lane 2	isolated artefact	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Station Lane 3	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Anvil Creek RTA 13 IF (#37-6-1315)	isolated artefact	low	common; low potential; low integrity	nil	no action required	collected under previous s90; site not relocated during present survey
Anvil Creek RTA 22 (#37-6-1324)	artefact scatter	low	common; low potential; low integrity	probably total	no action required	collected under previous s90; site not relocated during present survey
Black Creek RTA 2 (#37-6-1339)	artefact scatter	high	high potential; integrity; broad range of evidence; broad range and high density of evidence	nil	no action required	no direct impacts planned
Black Creek RTA 3 (#37-6-1340)	artefact scatter	low	common; low potential; low integrity	nil	no action required	collected under previous s90; site not relocated during present survey
Anvil Creek RTA 29 (formerly PAD18 Anvil Creek) (#37-6-1370)	artefact scatter	low	common; low potential	nil	protective measures to ensure impacts avoided	no direct impacts planned
PAD20 Black Creek (#37-6-1371)	artefact scatter	moderate	common; moderate potential	nil	no action required	no direct impacts planned
Greta Village Estate - 2 (#37-6-1665)	artefact scatter	low	common; low potential	probably total	surface collection	mitigate impacts
Lochinvar; Farley C	isolated artefact	low	common; low potential; low integrity	total	no action required	site not relocated during present survey
Lochinvar; Farley; E; (#37-6-0119)	artefact scatter	low	common; low potential; low integrity	total	no action required	collected under previous s90; site not relocated during present survey
Lochinvar; Farley; F; (#37-6-0120)	artefact scatter	low	common; low potential; low integrity	total	no action required	collected under previous s90; site not relocated during present survey
Heritage Green 24/A (#38-4-0714)	isolated artefact	low	common; low potential; low integrity	probably total	surface collection	mitigate impacts
Heritage Green 17/C (#38-4-0719)	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Heritage Green 17/D (#38-4-0722)	artefact scatter	low	common; low potential; low integrity	total	surface collection	mitigate impacts
Heritage Green 21/B (#38-4-0732)	isolated artefact	low	common; low potential; low integrity	nil	protective measures to ensure impacts avoided	no direct impacts planned

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DISCLAIMER

The information contained within this report is based on sources believed to be reliable. Every effort has been made to ensure accuracy by using the best possible data and standards available. The accuracy of information generated during the course of this field investigation is the responsibility of the consultant.

However, as no independent verification is necessarily available, South East Archaeology provides no guarantee that the base data (DECCW AHIMS) or information from informants (obtained in previous studies or during the course of this investigation) is necessarily correct, and accepts no responsibility for any resultant errors contained therein and any damage or loss which may follow to any person or party. Nevertheless this study has been completed to the highest professional standards.

APPENDIX 1:

DETAILED PLANS OF INVESTIGATION AREA, ARCHAEOLOGICAL SURVEY AREAS AND ABORIGINAL SITE LOCATIONS

Notes:

- Grid north is to right of page on all plans;
- Mapping runs from west (Minimbah end) to east (Maitland end);
- MGA grid in white at 100 metre intervals, eastings and northings all MGA (hence each single white square represents an area of 100 metres by 100 metres);
- Aerial photograph underlay courtesy Hunter 8 Alliance;
- Investigation area denoted by orange outline;
- Archaeological survey areas denoted by purple outlines/shading with purple numbers (approximate boundaries only);
- Aboriginal heritage site loci denoted by pink shapes and red stars (approximate locations only);
- Modified investigation area denoted by green outlines and shading;
- Portions of investigation area not subject to archaeological survey (typically due to property access constraints) denoted by orange outline and shading (survey numbers absent).


336600°E
336700°E
Belford Rail 1
Belford Rail 2
MM 01
MM 02
MM 03
MM 04
MM 05
6384800°N
6385000°N


MM 08
337000°E
MM 09
337100°E
MM 10
337200°E
MM 11
337300°E
6386600°N
337400°E
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6386400°N
337600°E
337700°E
MM 12
337800°E
Belford Rail 3
337900°E
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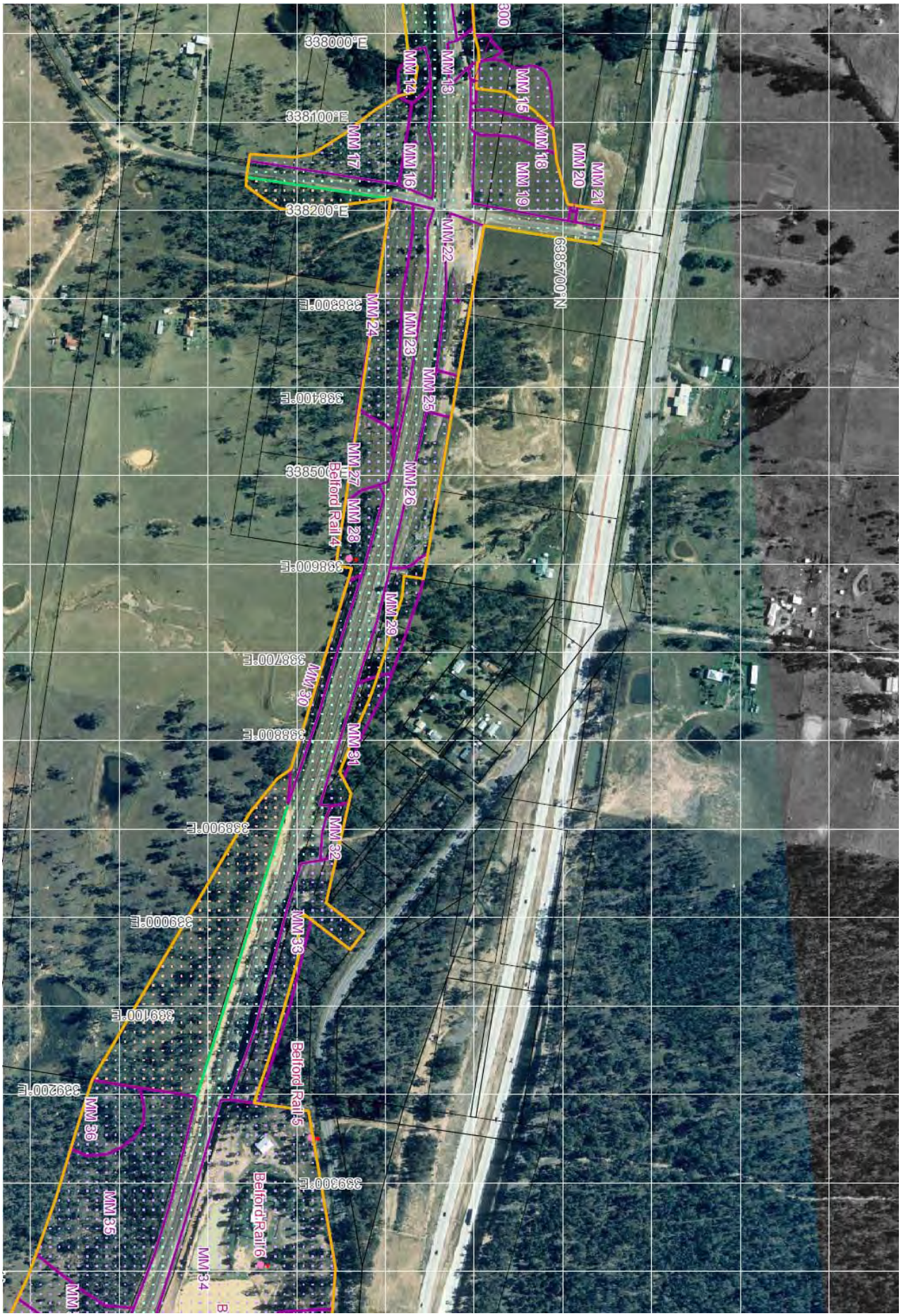
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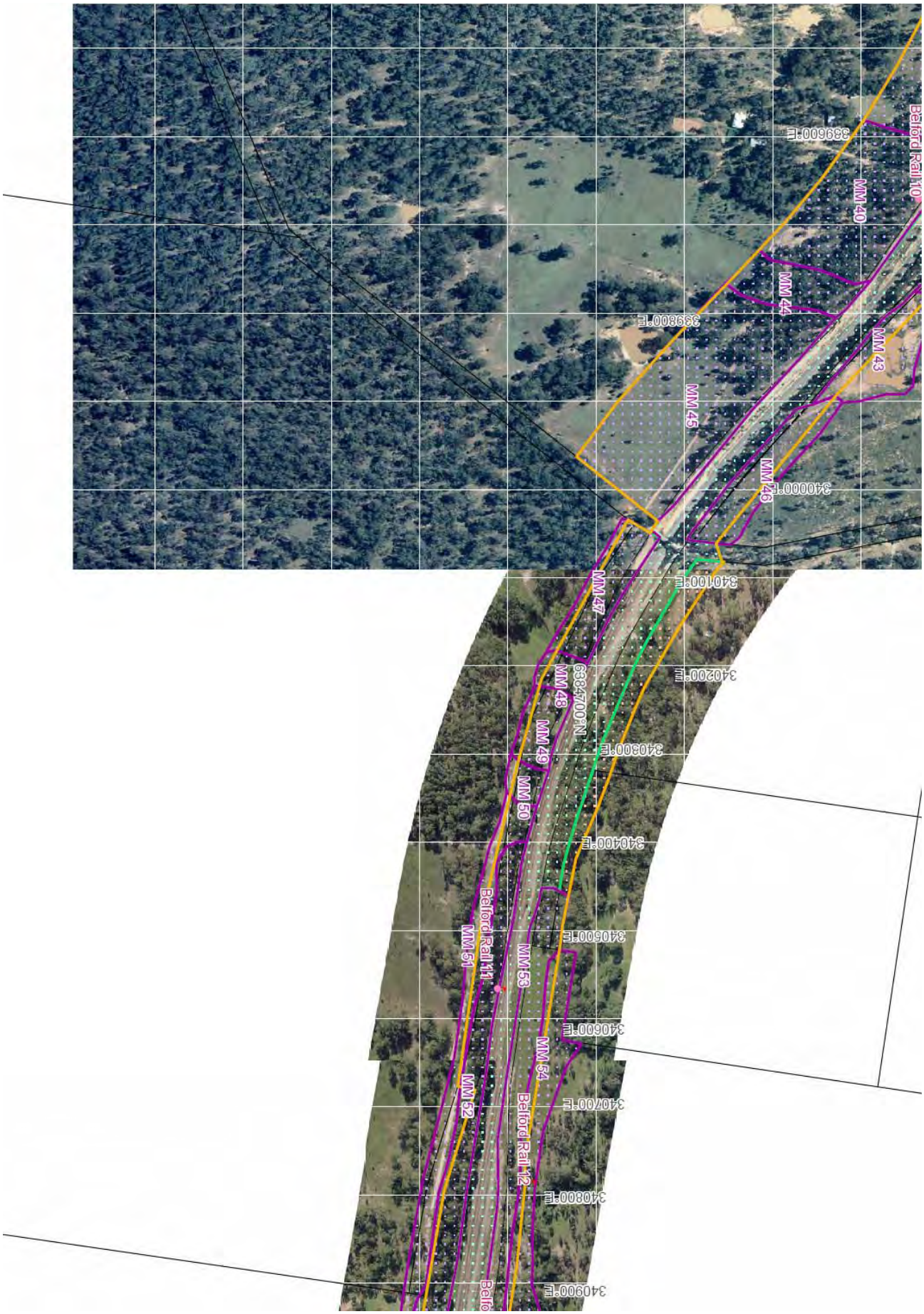
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Branxton Rail 14


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Branxton Rail Grinding Groove 1
6384200°N
Branxton Rail 15


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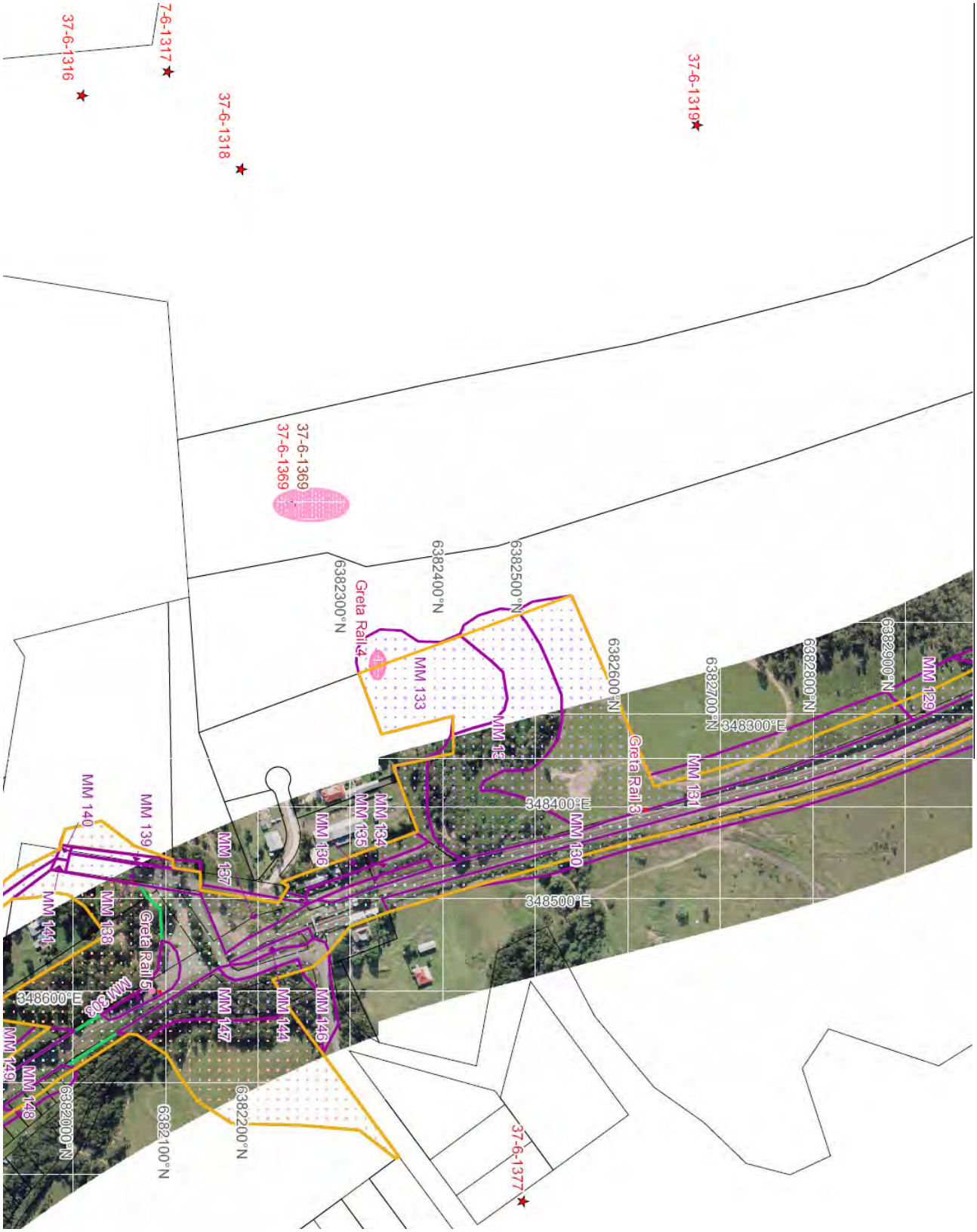
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MM 135
MM 136
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MM 139
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MM 130
MM 131
MM 129
Greta Rail 3
Greta Rail 5
MM 144
MM 145
MM 146
MM 147
MM 148
MM 149
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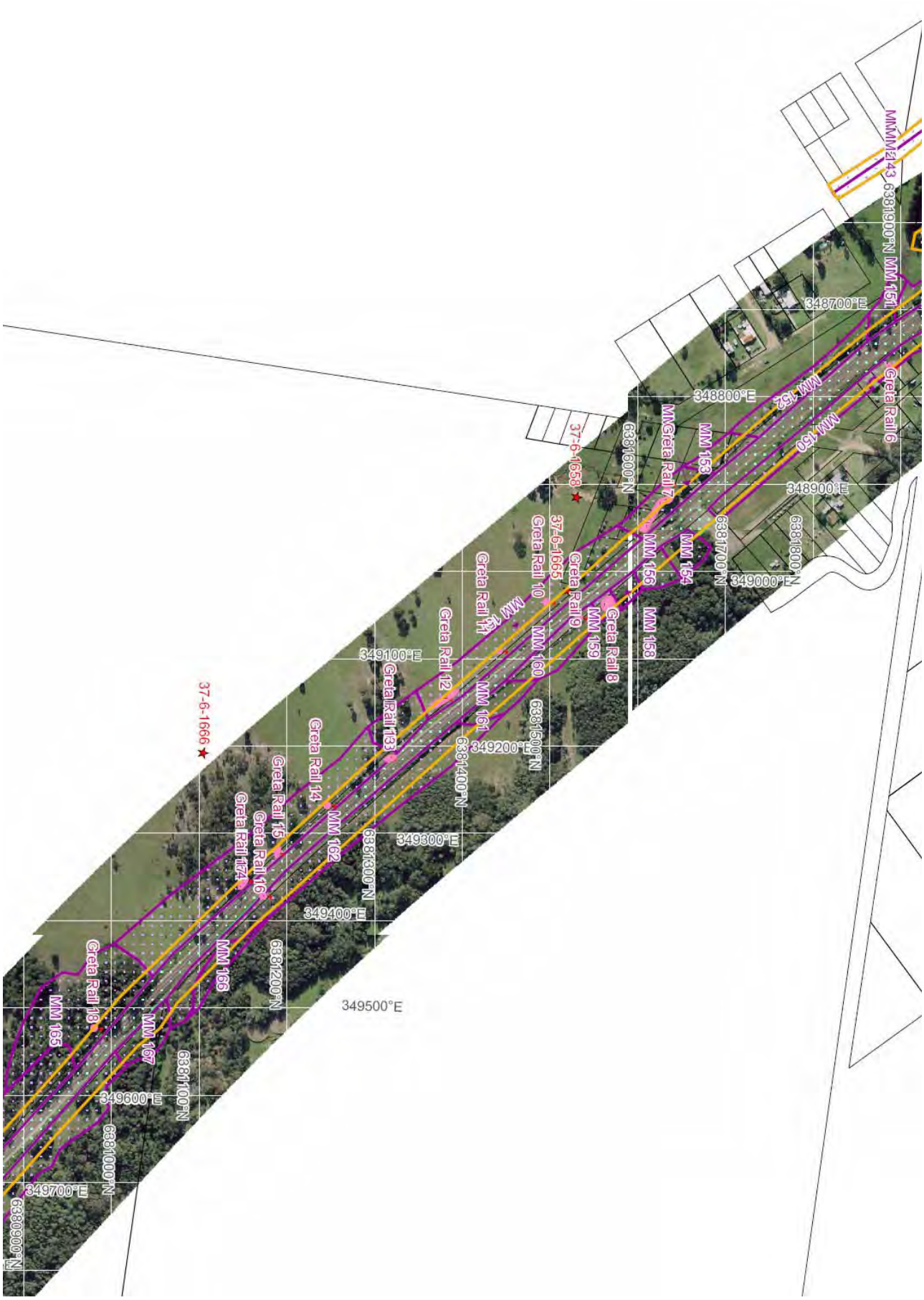
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MM 157
Greta Rail 11
MM 159
Greta Rail 8
MM 158
MM 160
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Greta Rail 18
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MM 167
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MM 169
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350300°E
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Allandale Rail 4
Allandale Rail 1
Allandale Rail 3
MM 170
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Allandale Rail 5
MM 171
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350500°E
6380300°N
MM 173
MM 172
Allandale Rail 6
Allandale Rail 7
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350700°E
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800°E


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MM 264
MM 267
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Allandale Rail 11
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Allandale Rail 14
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Allandale Rail 16
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Allandale Rail 18
MM 174
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MM 182
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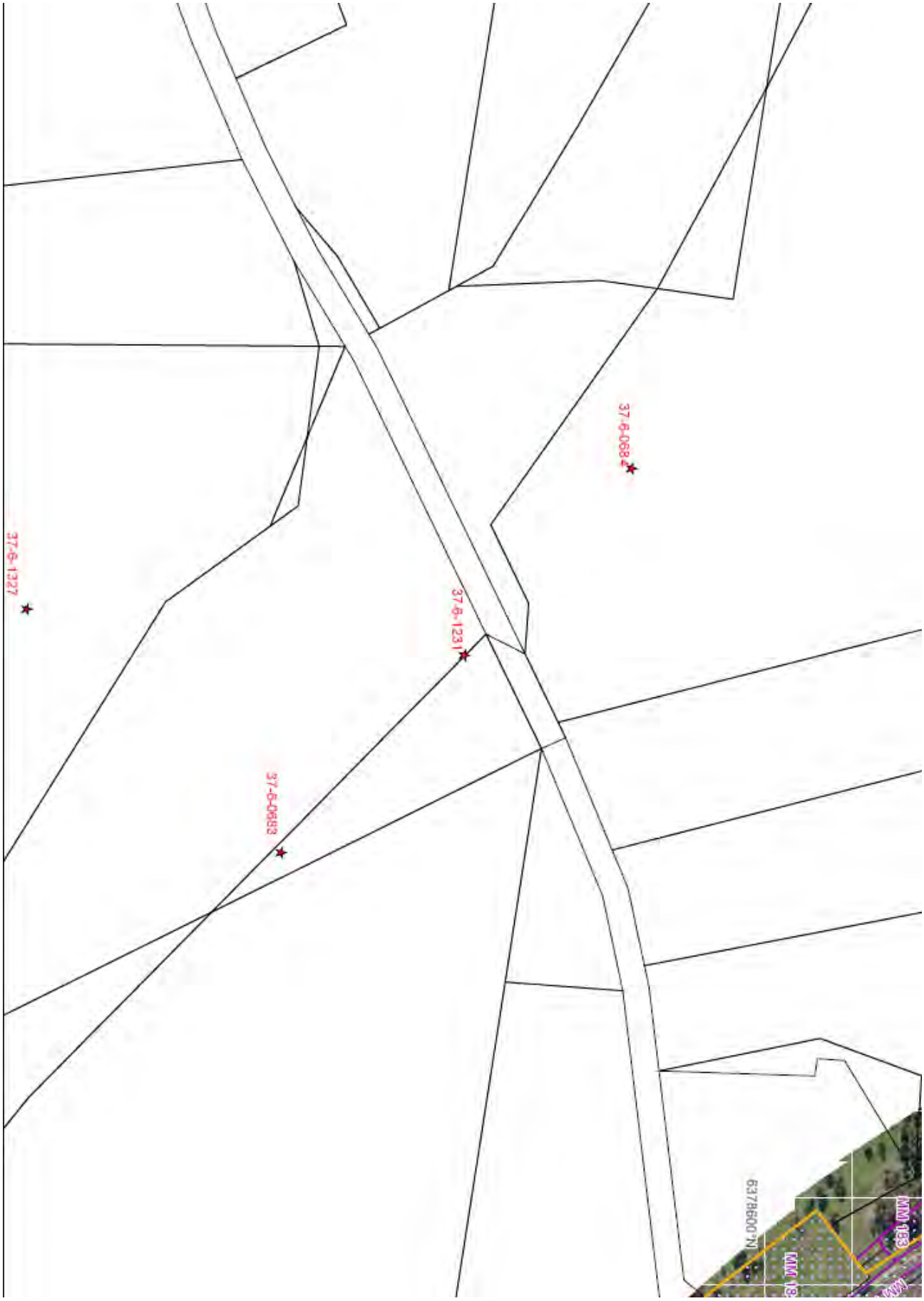
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MM 200
MM 202
Allandale Rail


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MM 221
Allandale Rail 20
Allandale Rail 21


354300°E
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355100°E
355200°E
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355400°E
355500°E
355600°E
355700°E
MM 221 Lochinvar Rail 1
MM 222
MM 223
MM 224
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MM 244
Station Lane 2
Station Lane 1
Lochinvar Rail 2
6378900mN


355800°E
355900°E
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356200°E
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Lochinvar Rail 3
Lochinvar Rail 4
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MM 246
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37-6-0116


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MM263
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MM270
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MM 274
MM 275
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MM 286
Rutherford Rail 1
Rutherford Rail 2
360300°E
360400°E
360500°E
360600°E
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360900°E
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6378100°N
6377800°N


361700°E
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362800°E
362900°E
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363100°E
6377700°N
6377600°N
6377500°N
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6377300°N
6377200°N
Rutherford Rail 3
MM 287
MM 288
MM 289
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MM 291
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MM 298
MM 299

APPENDIX 2:

ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM01	simple slope	gentle	<50	1	1	4	1,2	low-mod	A	1,280	30	25	320	0	0.000	some exposures, trees
MM02	drainage depression	gentle	<50	1	1	4	1,2	low-mod	A	800	20	10	80	1	0.013	cleared grassy paddock; scattered Eucalypts and small bushes
MM03	simple slope	gentle	<50	1	1	4	1,2	low-mod	A	800	20	10	80	0	0.000	cleared grassy paddock; scattered Eucalypts and small bushes
MM04	spur crest	gentle	>50	1	1	4	1,2	low-mod	A	800	20	10	80	0	0.000	cleared grassy paddock; scattered Eucalypts and small bushes
MM05	simple slope	gentle	<50	1	1,2	4	1,2	low-mod	A	1,600	20	10	160	0	0.000	cleared grassy paddock; scattered Eucalypts and small bushes
MM06	drainage depression	gentle	<50	1	1,2	4	1,2	low-mod	A	2,880	20-80	15-70	1136	2	0.002	some exposures; grassy paddock; dam wall has higher visibility
MM07	simple slope	gentle	<50	1	1	4	1,2	low-mod	A	480	20	10	48	0	0.000	some exposures; grassy paddock; quartz and silcrete cobbles
MM08	drainage depression	gentle	<50	1	1,2	3,4,5	1,2	low-mod	A	400	20	10	40	0	0.000	some exposures; grassy paddock; quartz and silcrete cobbles
MM09	simple slope	gentle	<50	1	1	4,5	1,2	low-mod	A	4,800	10	5	240	0	0.000	horse paddock; dense grass; Eucalypt stands
MM10	drainage depression	gentle	<50	2	1	4	1,2	low-mod	A	1,280	5	2	26	0	0.000	grassy paddock; some exposures
MM11	simple slope	gentle	>50	2	2	4	1,2	low-mod	A	2,880	1	0.5	14	0	0.000	regrowth scrub; paddocks between no access property
MM12	simple slope	level-very gentle	<50	2	2	4,5	1,2	low-mod	A/B	14,080	10-95	1-60	696	1	0.001	rail corridor and ballast track raise visibility; paddock has dense vegetation and limited visibility; dam; some exposures in paddock
MM13	drainage depression	gentle	<50	3	1	4,5	1,2,4	low-mod	A/B	150	1-90	1	2	0	0.000	north side of rail; drainage at Hermitage Road; drilling at time of survey; vegetation obscures visibility; cement over crossing with drainage; rail ballast shores up creek banks; water present at time of survey
MM14	drainage depression	gentle	<50	3	1	4,5	1,2,4	low-mod	A/B	150	1-90	1	2	0	0.000	south side of rail; drainage at Hermitage Road; drilling at time of survey; vegetation obscures visibility; cement over crossing with drainage; rail ballast shores up creek banks; water present at time of survey
MM15	simple slope	level-very gentle	>50	3	1,2	4,5	1,2	low-mod	A/B	700	1	0.5	4	0	0.000	grassy paddock; limited visibility
MM16	simple slope	gentle	>50	3	1	4,5	1,2	low-mod	A/B	1,920	5-90	1-2	27	0	0.000	rail modified vehicle track increases visibility; limited elsewhere
MM17	simple slope	gentle	<50	3	1,2	4,5	1,2	mod	A	2,200	5	2	44	0	0.000	tall grass cover; some exposures around trees; higher potential near creek
MM18	drainage depression	level-very gentle	<50	3	1	4,5	1	low-mod	A/B	1,500	1	0.5	8	0	0.000	grass; drainage ephemeral; limited visibility
MM19	simple slope	gentle	<50	3	1	4,5	1,2	low-mod	A/B	1,650	4-80	0.1-75	128	0	0.000	grassy paddock; rail survey markings increase visibility in places; limited visibility elsewhere
MM20	simple slope	gentle	>50	3	1,2	4,5	1,2	low-mod	A/B	750	1-70	0.1-60	151	0	0.000	slope up to flat area where New England Highway meets REF area; limited visibility; some exposures due to vehicle tracks
MM21	spur crest	level-very gentle	>50	1	1	4	1,2	low-mod	A	450	1-80	1-70	106	0	0.000	limited visibility; vehicle track
MM22	simple slope	gentle	>50	1	1	4,5	1,2	low-mod	A/B	700	1-90	0.1-1	6	0	0.000	rail modified vehicle track raises visibility, limited elsewhere; south east of Hermitage Road
MM23	drainage depression	steep	>50	1	1	5	1	high	A/B	6,380	1	0.5	32	0	0.000	rail cutting - modified

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM24	simple slope	level-very gentle	>50	1	1	4	1,2	mod	A	600	5	2	12	0	0.000	
MM25	spur crest	level-very gentle	<50	1	1	4,5	1,2	low-mod	A/B	200	1-90	0.1-80	81	0	0.000	rail modified vehicle track raises visibility, limited elsewhere
MM26	simple slope	level-very gentle	>50	1	1	4	1,2	low-mod	A/B	2,000	1-90	0.1-1	2	0	0.000	ballast covered rail vehicle track; limited visibility elsewhere; vegetated verges
MM27	simple slope	gentle	>50	1	1,2	4	1,2	mod	A	300	5-80	0.01-50	25	0	0.000	low visibility due to dense grass cover
MM28	drainage depression	moderate	<50	1	2	2	1,2	low-mod	A	300	5	2	6	2	66.667	she-oak forest with dense leaf litter; potential for extensive deposit
MM29	drainage depression	gentle	<50	3	1	4	1,2	low-mod	A/B	3,000	1-90	0.1-1	17	0	0.000	ballast covered rail vehicle track; limited visibility elsewhere
MM30	drainage depression	level-very gentle	<50	3	1	4	1,2	mod	A	1,200	3-5	2	24	0	0.000	
MM31	simple slope	gentle	<50	3	1	4,5	1,2	low-mod	A/B	200	1-90	0.1-1	2	0	0.000	ballast covered rail vehicle track; limited visibility elsewhere
MM32	spur crest	level-very gentle	>50	3	1	4,5	1,2	low-mod	A/B	200	1-90	0.1-1	2	0	0.000	ballast covered rail vehicle track; limited visibility elsewhere
MM33	simple slope	gentle	<50	3	1	4,5	1,2	low-mod	A/B	3,000	1-90	0.1-1	17	0	0.000	ballast covered rail vehicle track; limited visibility elsewhere; surrounding vegetation includes dry scrub with dense leaf litter and branch fall
MM34	simple slope	gentle	<50	1	1	4	1	high	A	6400	5	2	128	1	0.008	visibility on dam walls; top soil has been removed; private residence
MM35	simple slope	gentle	<50	1	2	4	1,2	mod	A	2,750	5-50	0.01-50	25	0	0.000	mainly vegetated by low density scrub with sporadic grass cover
MM36	spur crest	gentle	<50	1	2	4	1,2	mod	A	180	5	2	4	0	0.000	dense vegetation and leaf litter; limited archaeological visibility
MM37	drainage depression	level-very gentle	<50	1	2	4	1,2	mod	A	220	5	2	4	0	0.000	potential for significant archaeological deposits
MM38	simple slope	gentle	<50	2	2	4	1,2	low-mod	A	2,200	10	5	110	1	0.009	exposures throughout under vegetation
MM39	simple slope	moderate	<50	1	1,2	4	1,2	mod	A	1400	2	1	14	1	0.071	dense grass cover; some small exposures under regrowth Eucalypt forest; extensive exposures on south side of dam
MM40	simple slope	gentle	>50	1	1,2	4	1	low	A	6,600	0.1	0.1	7	0	0.000	dense grass cover
MM41	simple slope	level-very gentle	<50	2	1	4	1	low	A	3,300	0.1	0.1	3	2	0.606	dense grass cover
MM42	drainage depression	gentle	<50	1	1	4	1	mod	A	2,200	0.1	0.1	2	0	0.000	very low visibility
MM43	drainage depression	level-very gentle	<50	1	1	4	1	low	A	1,100	0.1	0.1	1	0	0.000	dam with drainage line
MM44	drainage depression	level-very gentle	<50	1	1	4,5	1	low	A	300	0.1	0.1	1	0	0.000	drainage with dam
MM45	simple slope	gentle	<50	1	1	4	1	low	A	2,200	0.1	0.1	2	0	0.000	cleared; some exposures towards eastern end
MM46	simple slope	level-very gentle	<50	1	1,2	4	1,2	low	A	6,600	2	1	66	0	0.000	some limited surface exposures
MM47	simple slope	gentle	<50	1	1,2	4	1,2	low	A	1,600	1	0.5	8	0	0.000	dense grass limits visibility
MM48	drainage depression	level-very gentle	<50	2	1,2	4	1,2	low	A	480	1	0.5	1	0	0.000	dense grass limits visibility
MM49	simple slope	gentle	<50	3	1,2	4	1,2	low	A	1,600	1	0.5	8	0	0.000	dense grass limits visibility
MM50	spur crest	level-very gentle	<50	3	1,2	4	1	low	A	480	1	0.5	1	0	0.000	dense grass limits visibility
MM51	simple slope	level-very gentle	<50	3	1	4	1	low	A	4,800	5	2	96	1	0.010	some exposures; several trees
MM52	drainage depression	level-very gentle	<50	2	2	4	1,2	low	A	10,400	5	2	208	0	0.000	some exposures; several trees

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM53	simple slope	level-very gentle	<50	2	1,2	4	1,2	low	A	5,600	10	5	280	1	0.004	dense grass; scattered vegetation
MM54	drainage depression	gentle	<50	2	1,2	4	1,2	low	A	600	1	0.5	3	10	3.333	dense grass cover; archaeological potential has been reduced due to modifications to landscape
MM55	valley flat	level-very gentle	<50	2	1,2	4	1,2	low-mod	A	5,600	5	2	112	0	0.000	gentle slopes/terrace flat; dense grass with scattered trees; banks of creek retain potential for deposit
MM56	drainage depression	gentle	<50	1	1,2	3,4,5	1,2	low-mod	A/B	1,580	1-70	0.1-60	769	5	0.007	creek line parallel to rail corridor; vegetation and modifications from rail; higher exposures along creek line
MM57	drainage depression	moderate	<50	1	1,2	4	1	low-mod	A/B	7,000	1	0.5	35	0	0.000	steep slope; close to rail corridor
MM58	simple slope	level-very gentle	<50	Sweet-water Ck	1,2	4	1,2	low-mod	A/B	4,600	5	2	92	0	0.000	gentle slopes/terrace flat; dense grass with scattered trees; banks of creek have potential deposit
MM59	simple slope	gentle	<50	Sweet-water Ck	1,2	4	1,2	low-mod	A	6,000	5-90	1-80	851	0	0.000	dense vegetation; limited visibility; dead trees; some exposures; vehicle track raises visibility
MM60	simple slope	gentle	>50	Sweet-water Ck	1,2	4	1	low	A	750	1	0.5	4	0	0.000	very low visibility; dense grass cover and some regrowth scrub
MM61	spur crest	gentle	>50	Sweet-water Ck	1,2	4	1,2	low-mod	B	600	100	90	540	7	0.013	granite intrusion on crest of hill
MM62	simple slope	gentle	>50	Sweet-water Ck	2	4	1	low	A	1,000	1	0.5	5	0	0.000	very low visibility; dense grass cover and regrowth scrub
MM63	simple slope	gentle	>50	Sweet-water Ck	1	4	1,2	low-mod	A	1,600	5	2	32	0	0.000	dense vegetation; limited visibility; dead trees; some exposures; vehicle track raises visibility
MM64	simple slope	level-very gentle	<50	Sweet-water Ck	1	4	1	high	A	6,000	1	0.5	30	0	0.000	dense ground cover; very limited visibility; low potential
MM65	drainage depression	gentle	<50	Sweet-water Ck	1	4	1,2	low	A	1,120	5	2	11	0	0.000	dense vegetation; limited visibility; dead trees; some exposures; vehicle track raises visibility
MM66	simple slope	gentle	<50	Sweet-water Ck	1	4	1,2	low-mod	A	2,400	5	2	48	0	0.000	dense grass limits visibility
MM67	drainage depression	gentle	<50	Sweet-water Ck	1,2	4	1,2,3	low	A	5,120	30	20	1024	4	0.004	grass and scattered trees; gravel washout
MM68	simple slope	gentle	<50	Sweet-water Ck	1,2	4	1,2	low-mod	A	300	5	2	6	0	0.000	dense grass limits visibility; scattered trees
MM69	drainage depression	gentle	<50	Sweet-water Ck	2	4	1	mod	A	2,400	1	0.5	12	0	0.000	modifications to drainage; low potential; she-oak forest and swampy terrain; limited visibility
MM70	flat	level-very gentle	>50	Sweet-water Ck	1,2	4	1	high	A	7,200	1	0.5	36	0	0.000	limited visibility; dense grass; modified ground surfaces; low potential
MM71	simple slope	gentle	<50	Sweet-water Ck	1	4	1,2,3	low-mod	A	3,450	5-90	1-80	232	24	0.103	grass; some surface exposures near fenceline into corridor; drainage rises to fence line; silty/gravel washouts in places; scattered Eucalypts and seasonal grasses
MM72	flat	level-very gentle	<50	Sweet-water Ck	1	4	1,2	high	A/B	6,000	1	0.5	30	0	0.000	highly modified
MM73	simple slope	level-very gentle	>50	Sweet-water Ck	1	4	1,2	mod	A	26,000	1	0.5	130	0	0.000	dense grass cover; some modifications but mostly paddock; potential for stratified archaeological deposit
MM74	drainage depression	moderate	<50	Sweet-water Ck	2	4	1,2	low	A	400	1	0.5	2	0	0.000	dense ground cover; she-oak forest and lantana with grasses
MM75	simple slope	gentle	<50	Black Ck; Sweet-water Ck	1	4	1,2	mod	A	3,200	1	0.5	16	1	0.063	very dense grass cover; extremely limited visibility; dam and spoil mound; horse and cattle disturbance

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

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MM76	simple slope	level-very gentle	>50	Black Ck	2	4	1,2	low	A	9,600	1	0.5	48	2	0.042	she-oak forest with grass; low visibility; small track through area raises visibility
MM77	simple slope	level-very gentle	>50	Black Ck	1	4	1,2	low-mod	A/B	30,300	5-90	1-30	448	1	0.002	dense grass; cattle paddock; vehicle track out of Rix Road is gravelled; some exposures in paddock
MM78	drainage depression	level-very gentle	<50	Black Ck	1	4	1,2	low-mod	A	3,200	30	20	640	3	0.005	dam wall is only visibility; grassy paddock with scattered Eucalypts
MM79	spur crest	gentle	>50	Black Ck	1,2	4,5	1,2	low-mod	A	2,800	5	2	56	0	0.000	dense grass; old abandoned houses; historical debris
MM80	simple slope	gentle	>50	Black Ck	1,2	4	1,2	low-mod	A	9,600	5	2	192	0	0.000	dense grass; historical debris
MM81	drainage depression	gentle	<50	Black Ck	1,2	4	1,2	low	A	3,200	5	1	32	0	0.000	dense grass; historical debris
MM82	simple slope	gentle	<50	Black Ck	1,2	4	1,2	low	A	3,200	5	1	32	0	0.000	denser, thicker vegetation as approach drainage
MM83	drainage depression	gentle	<50	Black Ck	1,2	4	1,2	low-mod	A/B	2,200	5	1	22	0	0.000	Black Creek; dense vegetation; thick grass; some outcrops of sandstone within drainage; test excavation warranted
MM84	drainage depression	gentle	<50	Black Ck	1	4	1,2	low-mod	A/B	1,000	1-90	0.5	5	0	0.000	dense vegetation near creek line; no visibility but archaeological potential high; test excavation warranted; ballast track surveyed
MM85	drainage depression	gentle	<50	Black Ck	2	4	1,2	mod	A	2000	1	0.5	10	0	0.000	dense vegetation including lantana and she-oak; limited visibility; due to proximity to Black Creek probable deposit
MM86	simple slope	gentle	<50	Black Ck	1,2	4	1,2	low-mod	A/B	8,000	1-90	0.5	40	0	0.000	dense vegetation; no visibility but archaeological potential high; ballast track surveyed
MM87	spur crest	gentle	>50	Black Ck	1,2	1,4	1,2,3	low-mod	A/B	2,000	40-90	1-30	484	0	0.000	some exposures - silty surface with some gravel; Eucalypt stands; ballast track surveyed
MM88	simple slope	gentle	>50	1	1,2	4,5	1,2	low	A	800	30	20	160	0	0.000	some exposures; mostly dense grass; earthworks further out from dam; ballast track surveyed
MM89	ridge crest	gentle	>50	1	2	4	1,2	low	A	1500	1	0.5	8	0	0.000	dense leaf litter and limited visibility
MM90	drainage depression	gentle	<50	1	1,2	4,5	1,2	low-mod	A	960	30	20	192	0	0.000	
MM91	simple slope	gentle	>50	1	1,2	4,5	1,2	low-mod	A	10,800	5-90	1-20	260	0	0.000	dense grass; Acacia/paperbark stands; some exposures with gravel; ballast track surveyed; old metal possibly heritage debris; drainage culverts
MM92	simple slope	gentle	>50	1	1,2	4	1,2	mod	A	54,000	1	0.5	270	5	0.019	light vehicle access tracks provides only visibility; dense Eucalypt regrowth and ground cover
MM93	simple slope	level-very gentle	<50	1	1	4	1,2	low	A	3,080	1	0.5	15	0	0.000	moderate grass cover; limited archaeological visibility; deposit is possible but of limited potential; modified drainage line and spoil mounds
MM94	drainage depression	gentle	<50	1	1	4	1,2,3	low-mod	A	16,200	1	0.5	81	0	0.000	dense vegetation includes swamp grasses; dam; water in drainage at time of survey
MM95	simple slope	level-very gentle	<50	1	1,2	4	1,2	low-mod	A/B	10,000	30	20	2000	0	0.000	dense regrowth vegetation; some natural surfaces; some exposures raise visibility; spoil mound
MM96	spur crest	level-very gentle	>50	1	2	4	1,2	low-mod	A	1,600	45	40	640	2	0.003	some exposures; leaf litter; regrowth tea-tree and Eucalypt scrub; some dead trees

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM97	flat	level-very gentle	<50	1	1	4	1,2	low-mod	A/B	10,800	1	0.5	54	0	0.000	flat paddock between drainage and slope; dense vegetation; limited visibility
MM98	simple slope	gentle	<50	1	1	4,5	1,2	low-mod	A	720	1	0.5	1	0	0.000	flat grassy paddock between drainage and slope; spoil mounds; limited visibility
MM99	simple slope	level-very gentle	<50	1	1	4	1	low	A	1,400	3	0.5	7	0	0.000	small rise between two drainage lines; archaeological potential low to moderate
MM100	drainage depression	level-very gentle	<50	2	1,2	4,5	1,2	mod	A	400	1	0.5	2	0	0.000	light vehicle access tracks provide only visibility; dense Eucalypt regrowth and ground cover
MM101	simple slope	gentle	>50	1	1,2	4,5	1,2	low-mod	A	8,400	1	0.5	42	0	0.000	dense dry grass; Eucalypt forest; residential developments; vineyards
MM102	drainage depression	gentle	<50	3	1,2	4,5	1,2	low-mod	A	1,200	5	2	24	0	0.000	dense vegetation; limited visibility except on vehicle track
MM103	simple slope	gentle	<50	3	1,2	4	1,2	low-mod	A/B	12,600	5-90	1-10	666	0	0.000	dense grass and vegetation; some exposures; some mature trees; dense scrub; ballast track also surveyed
MM104	spur crest	level-very gentle	>50	1	1,2	4	1,2	low-mod	A/B	1,000	5-90	2	20	0	0.000	dense grass and vegetation; some exposures; some mature trees; dense scrub; ballast track also surveyed
MM105	simple slope	gentle	<50	1	1,2	4	1,2	low	A	1,000	5	2	20	0	0.000	dense grass and vegetation; some exposures; some mature trees; dense scrub; ballast track also surveyed
MM106	drainage depression	gentle	<50	1	1,2	4	1,2	low-mod	A	960	5	2	10	0	0.000	dense scrub
MM107	simple slope	gentle	>50	1	1,2	4	1,2	low-mod	A	3,600	5	2	72	0	0.000	dense scrub
MM108	simple slope	gentle	<50	1	1	4	1	low	A	640	5	2	6	0	0.000	grassy paddock
MM109	drainage depression	gentle	<50	1	1,2	3,4	1,2,3	low	A	160	5	2	2	0	0.000	grassy paddock; thorny bushes
MM110	simple slope	gentle	<50	1	1	4	1,2	low	A	1,600	1	0.5	2	0	0.000	grassy paddock; thorny bushes; scattered Eucalypt; cattle tracks
MM111	simple slope	gentle	>50	1	1,2	4	1,2	low	A	2,800	5-90	1	28	0	0.000	dense scrub; ballast track surveyed
MM112	spur crest	level-very gentle	>50	1	2	4	1,2	low	A	400	1	0.5	1	0	0.000	grassy paddock; she-oak thicket
MM113	spur crest	gentle	>50	1	1	low	1,2	low	A/B	2,160	5-90	1	22	1	0.045	dense scrub; dense leaf litter; ballast track
MM114	simple slope	level-very gentle	>50	1	2	4,5	1,2,3	low	A	2,000	1	0.5	10	0	0.000	possibly elevated flat; silty soil; dense grass; Casuarina thicket
MM115	simple slope	moderate	<50	Anvil Ck	2	4	1,2	mod	A	3,000	1	0.5	15	0	0.000	dense leaf litter and grass cover; limited visibility
MM116	drainage depression	gentle	<50	Anvil Ck	1,2	4	1,2,3,4	low-mod	A	400	5	2	8	0	0.000	concrete slab in drainage; water present at time of survey; sandstone bedrock
MM117	drainage depression	moderate	<50	Anvil Ck	2	4	1,2	mod	A	500	1	0.5	3	0	0.000	stabilisation works; riparian vegetation
MM118	simple slope	gentle	<50	Anvil Ck	1,2	4	1,3	low	A	2,400	20	10	240	12	0.050	dry scrub with dense leaf litter and limited visibility
MM119	simple slope	gentle	>50	1	2	4	1,2	mod	A	8,560	1	0.5	43	0	0.000	small track provides some visibility; dense grass cover; Casuarina, yellow box and Eucalypt communities within western portion; graduates into sclerophyll forest; several walled wells located within area; microtopography; limited visibility
MM120	simple slope	gentle	<50	1	2	4	1,2	low	A	2,400	1	0.5	12	0	0.000	dense bush and grass cover limits visibility; light vehicle track through area along rail corridor provides only visibility

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

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MM121	drainage depression	level-very gentle	<50	1	2	3,4	1,2	low	A	600	1	0.5	3	0	0.000	vegetation obscures bank
MM122	simple slope	gentle	<50	1	2	4	1,2	low	A	7200	1	0.5	36	1	0.028	dense vegetation and grass cover; light vehicle access provides some visibility
MM123	drainage depression	level-very gentle	<50	1	2	2,4	1,2	mod	A	1,200	1	0.5	6	0	0.000	artificial pond; low area of natural drainage
MM124	simple slope	gentle	<50	1	1,2	4	1,2	mod	A	7,500	1	0.5	37.5	1	0.027	dense grass cover; limited visibility; some exposures
MM125	spur crest	level-very gentle	>50	1	1	4	1	mod	A	400	1	0.5	2	0	0.000	dense grass cover
MM126	drainage depression	steep	<50	1	1,2	4	1,2	mod	A	1,200	1	0.5	6	0	0.000	stabilisation from rail; sedimentary deposits limits visibility; dense grass cover and regrowth forest
MM127	simple slope	gentle	<50	1	1,2	4	1,2	mod	A	1,500	1	0.5	7.5	0	0.000	dense grass cover; limited visibility; some exposures
MM128	simple slope	moderate	<50	1	1,2	4	1,2	mod	A	2,880	1	0.5	14	0	0.000	dense grass cover; very limited visibility
MM129	spur crest	level-very gentle	>50	1	1	4	1	mod	A/B	400	1	0.5	2	0	0.000	dense grass cover
MM130	flat	level-very gentle	>50	1	1	4	1	mod	A	25,300	5	0.5	126.5	0	0.000	modified surfaces; low potential for in situ deposits
MM131	flat	level-very gentle	>50	Sawyers Ck	2	4	1	mod	A	8,000	1	0.5	40	0	0.000	potentially modified surface from golf course; dense grass and limited visibility
MM132	drainage depression	moderate	<50	Sawyers Ck	1	3,4	1,2,3	low	A	6,000	5	1	60	0	0.000	standing water at time of survey; dense vegetation along bank and within creek; creek has bedrock of sandstone - no grooves located
MM133	simple slope	gentle	<50	Sawyers Ck	1	1	1,2	low	A	1800	1	0.5	9	16	1.778	machinery, rubbish, fencing; dense grass; almost no visibility; clearing at western most edge
MM134	flat	level-very gentle	>50	Sawyers Ck	1	4,5	1	high	A/B	2,200	1	0.5	11	0	0.000	modified surfaces
MM135	hillock	steep	>50	Sawyers Ck	1	4,5	1	high	A/B	1,200	1	0.5	6	0	0.000	modified surfaces
MM136	simple slope	level-very gentle	>50	Sawyers Ck	1	4	1	mod	A	1,100	0.5	0.5	6	0	0.000	modified surfaces
MM137	simple slope	gentle	<50	Sawyers Ck	1	4,5	1,2	high	A	2,200	0.5	0.5	11	0	0.000	
MM138	simple slope	level-very gentle	<50	Sawyers Ck	1	4	1	low	A	2,200	0.5	0.5	11	0	0.000	cleared road verge; limited potential for in situ deposits
MM139	simple slope	level-very gentle	<50	Sawyers Ck	1	4	1,2	Low	A	2,200	5	1	22	0	0.000	grass covered verge; limited potential for in situ deposits
MM140	drainage depression	gentle	<50	Sawyers Ck	1	4	1	mod	A	2,200	0.5	0.5	11	0	0.000	artificial drainage channel
MM141	drainage depression	gentle	<50	Sawyers Ck	1	4	1	low	A	220	0.5	0.5	1	0	0.000	artificial drainage channel
MM142	simple slope	level-very gentle	<50	Sawyers Ck	1	4	1	low	A	2,200	0.5	0.5	11	0	0.000	grass covered verge; driveways crossing the survey area; limited potential for in situ deposits
MM143	simple slope	gentle	>50	Sawyers Ck	1	4	1	low	A	2,200	0.5	0.5	11	0	0.000	lightly vegetated road verge
MM144	ridge crest	steep	<50	Sawyers Ck	1	4,5	1	high	A	220	0.5	0.5	1	0	0.000	very dense vegetation
MM146	flat	level-very gentle	>50	Sawyers Ck	1	4	1	high	A/B	220	0.5	0.5	1	0	0.000	modified surface - lawns and driveways; limited potential for in situ deposits
MM147	drainage depression	level-very gentle	<50	Sawyers Ck	2	4	1,2	low	A	200	1	0.5	1	0	0.000	dense grass
MM148	drainage depression	gentle	<50	Sawyers Ck	1	4	1,3	low-mod	A	800	1	0.5	1	0	0.000	dense grass; rubbish

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

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MM149	simple slope	gentle	<50	Sawyers Ck	2	4	1,2	low	A	500	1	0.5	3	0	0.000	she-oak scrub; thick brambles and lantana
MM150	simple slope	gentle	<50	Sawyers Ck	1	4	1,2	low	A	3,000	10	5	150	1	0.007	grassy paddock
MM151	drainage depression	level-very gentle	<50	Sawyers Ck	1,2	4	1,2	low	A	300	1	0.5	1	0	0.000	very limited visibility; residential developments
MM152	simple slope	level-very gentle	<50	Sawyers Ck	1	4	1,2	low	A	2,000	1	0.5	10	0	0.000	possibly elevated flat; grassy paddock; residential developments
MM153	simple slope	gentle	<50	2	1,2	4	1,2	mod	A	1,104	1	0.5	6	0	0.000	limited visibility; sporadic exposures along vehicle track; moderate grass coverage; small she-oak stands; dense leaf litter
MM154	drainage depression	moderate	<50	2	2	4	1,2	mod	A	1,000	1	0.5	5	0	0.000	dense she-oak with lantana throughout
MM155	drainage depression	gentle	<50	2	1,2	3,4	1,2	low	A	800	1	0.5	4	16	4.000	very low visibility; site located above Anvil Creek; dense vegetation and trees surround exposures
MM156	drainage depression	level-very gentle	<50	1	2	4	1,2	mod	A	800	1	0.5	4	0	0.000	grass clearing between dense she-oak
MM157	simple slope	gentle	<50	2	1,2	4	1,2	mod	A	5,520	1	0.5	28	9	0.326	limited visibility; sporadic exposures along vehicle track; moderate grass coverage; small she-oak stands; dense leaf litter
MM158	drainage depression	moderate	<50	1	2	4	1,2	low	A	1,000	1	0.5	5	0	0.000	dense ground cover - grass and leaf litter
MM159	spur crest	gentle	<50	2	1,2	4	1,2	mod	A	400	1	0.5	2	13	6.500	small spur between two drainage lines
MM160	simple slope	level-very gentle	<50	2	1,2	4	1,2	low-mod	A	3,500	1	0.5	18	4	0.229	moderate grass cover; limited visibility; some small exposures
MM161	drainage depression	gentle	<50	1	1	4	1	low	A	400	1	0.5	2	0	0.000	moderately dense grass; limited visibility
MM162	drainage depression	level-very gentle	<50	1	1	4	1,2	mod	A	1200	1	0.5	6	0	0.000	paddock; limited visibility
MM163	drainage depression	gentle	<50	3	2	3,4	1,2,3	mod	A	1,600	1	0.5	8	0	0.000	dense lantana; very limited visibility; artefacts located along a vehicle access track; she-oak and lantana along track to south
MM164	simple slope	gentle	<50	2	1,2	4	1,2	mod	A	6,624	1	0.5	33	17	0.513	limited visibility; sporadic exposures along vehicle track; moderate grass cover; small she-oak stands; dense leaf litter
MM165	drainage depression	level-very gentle	<50	3	2	3,4	1,2,3	mod	A	4,800	1	0.5	24	2	0.083	dense lantana; very limited visibility; artefacts located along vehicle access track; she-oak and lantana along track to south of site
MM166	spur crest	moderate	>50	3	1	4	1	mod	A	1,600	1	0.5	8	0	0.000	dense grass cover; very limited visibility; horse activity
MM167	drainage depression	level-very gentle	<50	3	2	4	1,2	low	A	420	0.5	0.5	2	0	0.000	dense grass cover; potential for deposits
MM168	flat	level-very gentle	<50	3	2	4	1,2	low	A	14,350	0.5	0.5	72	1	0.014	areas of dense vegetation with grass dispersed throughout; she-oaks dominate with dense cover of rotting vegetation; very limited surface visibility; potential for deposits
MM169	simple slope	gentle	<50	2	1,2	4	1,2	mod	A	23,552	1	0.5	117.76	5	0.042	limited visibility; sporadic exposures along vehicle track; moderate grass cover; small she-oak stands; dense leaf litter
MM170	simple slope	gentle	<50	Anvil Ck	1	4	1	mod	A	900	0.5	0.5	5	4	0.889	dense grass cover
MM171	simple slope	level-very gentle	<50	Anvil Ck	2	4	1,2	low	A	3,600	1	1	36	7	0.194	regrowth she-oak community

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

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MM172	drainage depression	gentle	<50	Anvil Ck	2	4	1,2	low	A	450	50-0.01	10-0.01	5	0	0.000	moderate potential for in situ deposits, close to Anvil Creek; dense ground cover results in low visibility
MM173	drainage depression	gentle	<50	Anvil Ck	1,2	4,5	1,2	mod	A	400	1	0.5	2	0	0.000	she-oak forest; limited visibility
MM174	simple slope	level-very gentle	<50	Anvil Ck	2	4	1,2	low	A	12,600	10-0.01	5-0.01	100	82	0.820	extensive she-oak community at western end of survey unit; at eastern end, Eucalyptus forest with dense leaf litter; horse trail located along boundary fence within survey area, providing the only reasonable visibility
MM175	simple slope	level-very gentle	<50	Anvil Ck	1,2	4	1,2	mod	A	16800	1	0.5	84	9	0.107	moderate grass cover; she-oak forest in western portion; limited visibility over majority
MM176	simple slope	level-very gentle	<50	Anvil Ck	2	4	1,2	low-mod	A	4,250	1	0.5	21	0	0.000	some small areas of exposure; dense leaf litter; additional exposures amongst grass; Eucalypts dominant; open grassland
MM177	flat	level-very gentle	<50	Anvil Ck	1,2	4	1,2	mod	A	2400	1	0.5	12	3	0.250	light vehicle access tracks provide only visibility; dense Eucalypt regrowth and ground cover
MM178	drainage depression	gentle	<50	Anvil Ck	2	3,4	1	mod	A	640	1	0.5	3	0	0.000	limited visibility; dense ground cover; erosion
MM179	drainage depression	moderate	<50	Anvil Ck	2	4	1	low	A	250	1	0.5	1	0	0.000	Anvil Creek has been modified to prevent further erosion; grass cover and Eucalypt scrub; regrowth scrub 20 metres from rail
MM180	drainage depression	gentle	<50	Anvil Ck	2	4	1,2	mod	A	12,000	1	0.5	60	0	0.000	bull-rushes and reeds further north within creek; leaf litter limits visibility; stratigraphy evident in creek bed; she-oak, grass, lantana
MM181	simple slope	gentle	<50	Anvil Ck	1,2	4	1,2	mod	A	2400	1	0.5	12	12	1.000	dense grass cover; some regrowth bush; very low exposure level
MM182	simple slope	level-very gentle	>50	2	1,2	4	1,2	mod	A	2,400	1	0.5	12	1	0.083	access track only area of visibility; Eucalypt forest; dense grass cover
MM183	flat	level-very gentle	>50	2	1,2	4	1,2	mod	A	1,600	1	0.5	8	0	0.000	dense grass cover; leaf litter; low visibility; small access track provides only visibility; Eucalypt forest
MM184	simple slope	gentle	>50	2	1,2	4	1,2	mod	A	2,400	1	0.5	12	0	0.000	dense grass cover; leaf litter; low visibility; small access track provides only visibility; Eucalypt forest
MM185	simple slope	gentle	>50	Anvil Ck	1	4	1	mod	A	3,600	1	0.5	18	0	0.000	dense grass cover except for small overgrown access track; very limited visibility; European sites and artefacts throughout the area
MM186	simple slope	gentle	<50	Anvil Ck	2	4	1,2	low	A	840	10	5	42	0	0.000	dense grass and scattered trees; some exposures
MM187	simple slope	level-very gentle	>50	2	1	4	1	mod	A	13,500	1	0.5	68	0	0.000	dense grass cover; leaf litter; vehicle impacts; some mature Eucalypt within 10m of rail corridor; undulating terrain
MM188	simple slope	gentle	<50	1	2	4	1,2	low	A	2,760	5-30	1-20	73	0	0.000	dense grass and scattered trees; some exposures
MM189	simple slope	gentle	<50	1	2	4	1,2	low	A	2,800	5	2	56	0	0.000	dense grass; cow paddock
MM190	drainage depression	moderate	<50	1	2	4	1,2	low	A	450	5-90	1-85	128	0	0.000	dam wall; dense vegetation; igneous rock outcrops not suitable for grooves
MM191	simple slope	moderate	<50	1	2	4	1,2	low	A	2,800	5	2	56	0	0.000	dense grass; cow paddock; scattered Eucalypt trees; higher visibility on dam wall

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM192	drainage depression	gentle	<50	1	1	4	1,2	low-mod	A	1,350	10-90	5-80	180	0	0.000	dense grass; cow paddock; higher visibility around dam
MM193	drainage depression	gentle	<50	1	1	4	1,2	low	A	560	10	5	28	0	0.000	dense grass; cow paddock; scattered Eucalypt trees; higher visibility on dam wall
MM194	simple slope	moderate	<50	1	1	4	1,2	low-mod	A	1,200	5	2	24	0	0.000	dense grass
MM195	simple slope	moderate	<50	1	1	4	1,2	low	A	2,800	5	2	56	0	0.000	dense grass; cow paddock; scattered Eucalypt trees
MM196	simple slope	gentle	<50	1	1	4	1,2	low-mod	A	4,000	10	5	200	0	0.000	grassy paddock; ploughed
MM197	spur crest	gentle	>50	1	1	4	1,2	mod	A/B	1,500	90-100	0.1-20	200	1	0.005	north side of rail; road base on road verge; light tarmac road; Old North road - medium sized road base with basalt in places; sorted ground surface; pasture grasses; cattle
MM198	spur crest	gentle	>50	1	1	4	1,2	mod	A/B	1,500	90-100	0.1-20	200	0	0.000	south side of rail; road base on road verge; light tarmac road; Old North road - medium sized road base with basalt in places; sorted ground surface; pasture grasses; cattle
MM199	simple slope	moderate	<50	1	1	4	1	low-mod	A	8,000	1	0.5	40	0	0.000	grassy paddock; north side of Old North Road where investigation area extends away from rail
MM200	simple slope	gentle	<50	1	1	4	1	mod	A	3,200	1	0.5	16	0	0.000	dense grass cover; little to no exposures
MM201	drainage depression	moderate	<50	1	1	4	1	mod	A	360	1	1	4	0	0.000	artificial drainage; low visibility; limited archaeological potential
MM202	simple slope	moderate	<50	1	1	4	1,2	low-mod	A	240	10	5	12	0	0.000	grassy paddock; north side of small drainage
MM203	simple slope	moderate	>50	1	1,2	4	1,3	low-mod	A	240	10	5	12	0	0.000	dense grass; cow paddock
MM204	drainage depression	gentle	<50	1	1	4	1,2	low	A	2,400	30	20	480	1	0.002	grassy paddock; some exposures; silty soil
MM205	simple slope	gentle	<50	1	1	4	1,2	low	A	2,000	5	2	40	0	0.000	dense grass; cow paddock; scattered trees
MM206	drainage depression	gentle	<50	1	1	4	1,2	low	A	600	15	10	60	0	0.000	dense grass; cow paddock; scattered trees
MM207	simple slope	gentle	>50	1	1	4	1,2	mod-high	A/B	3,000	90	0.5	15	2	0.133	rail corridor cut in; modified slope
MM208	simple slope	moderate	<50	1	1	4	1,2	low-mod	A	1,500	10	5	75	0	0.000	dense grass; cow paddock; scattered trees
MM209	simple slope	gentle	<50	1	1	4	1,2	low	A	4,000	10	5	200	0	0.000	dense grass; cow paddock; scattered trees
MM210	spur crest	gentle	<50	1	2	4	1,2	low	A	300	10	5	15	0	0.000	dense grass; cow paddock
MM211	simple slope	gentle	<50	1	1	4	1,3	low	A	2,000	10	5	100	0	0.000	dense grass; cow paddock
MM212	hillock	level-very gentle	>50	1	1	4,5	1,2,4	mod-high	A/B	1,400	90	0.5	7	0	0.000	ballast vehicle access track; thicker vegetation off track; spoil mound separates tracks from paddocks below
MM213	drainage depression	gentle	<50	1	1	4	1,2	low	A	1,500	5	2	30	0	0.000	dense grass; cow paddock
MM214	simple slope	gentle	<50	1	1	4	1,2	low	A	2,400	5	2	48	0	0.000	dense grass; cow paddock
MM215	simple slope	gentle	>50	1	1	4,5	1,2,4	mod	A/B	1,500	90	0.5	8	0	0.000	vehicle access track with rail ballast surface
MM216	drainage depression	gentle	>50	1	1	4,5	1,2,4	mod	A/B	500	90	0.5	3	0	0.000	vehicle access track with rail ballast surface; thicker vegetation off track; spoil mound separates tracks from paddocks below
MM217	simple slope	gentle	<50	1	1	4	1,2	low	A	200	5	1	2	0	0.000	dense grass; cow paddock; slope continues into no access area
MM218	simple slope	gentle	<50	1	1,2	4	1,2	mod	A	6,300	1	0.5	32	0	0.000	dense vegetation and leaf litter

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM219	simple slope	gentle	>50	1	1	4,5	1,2,4	mod	A/B	3,000	90	0.5	15	0	0.000	vehicle access track with rail ballast surface
MM220	drainage depression	gentle	<50	1	1	4	1,2	low-mod	A	590	10-20	5-10	35	0	0.000	vegetated pasture land; exposures around trees; dam wall has higher visibility
MM221	simple slope	gentle	<50	1	1	4	1,2	mod	A/B	1,060	1-60	0.5-50	35	1	0.029	grassy, pastoral use; exposures around trees
MM221	drainage depression	moderate	<50	1	1,2	4	1,2	mod	A	350	1	0.5	2	0	0.000	leaf litter; dam wall is vegetated with few exposures
MM222	drainage depression	gentle	<50	1	1	4	1,2	mod	A/B	350	10	5	17	2	0.118	some exposures; grassy, pastoral use
MM223	spur crest	level-very gentle	>50	1	1	4	1,2	mod	A/B	2,200	1-60	0.5-50	105	0	0.000	grassy, pastoral use; exposures around trees
MM224	simple slope	gentle	<50	1	1	4	1,2	mod	A/B	2,100	1-90	0.5-80	85	1	0.012	grassy, pastoral use; exposures around trees
MM225	drainage depression	gentle	<50	1	1	4,5	1,2,3,4	mod	A/B	1,200	1-10	0.5-5	15	0	0.000	drainage with dam; grassy, pastoral use; dam wall has slightly higher visibility
MM226	simple slope	gentle	<50	1	1	4,5	1,2	mod	A/B	1,100	1-90	0.5-80	85	0	0.000	grassy, pastoral use; some exposures near trees and cattle tracks
MM227	drainage depression	gentle	<50	1	1	3,5	1	mod	A/B	2,200	15	10	220	2	0.009	discontinuous areas of ground exposure along creek channel; natural tuff seam exposed in creek bank
MM228	simple slope	gentle	<50	1	1,2	4	1,2	mod	A/B	1,000	5	2	20	0	0.000	some visibility around trees, otherwise dense pasture grass
MM229	simple slope	gentle	<50	1	1	4	1	mod	A/B	24,000	0.1	0.1	24	0	0.000	well grassed paddocks; some stock tracks; some localised ground surface erosion but very minimal
MM230	drainage depression	gentle	<50	1	1	3,4	1,3	mod	A/B	14,000	0.1	0.1	14	0	0.000	well grassed paddocks; small areas of exposures but swampy; cattle tracks
MM231	ridge crest	level-very gentle	<50	1	1	4	1,4	mod	A/B	6,000	5	2	120	0	0.000	shed, cattle yards, vehicle tracks; minor patches of visibility in between grass in some areas
MM232	simple slope	gentle	<50	1	1	4	1	mod	A/B	1,500	5	3	45	0	0.000	well grassed slope; some small areas of ground surface exposures; survey area contains Station Lane and small area of private land along road boundary on eastern side of Station Lane; highly modified along Station Lane
MM233	simple slope	gentle	>50	1	1	4,5	1	low	A	1,000	10	5	50	0	0.000	dense grass; horse paddock; private residence with dam
MM234	simple slope	gentle	>50	1	1	4	1,2	low	A	2,400	5	2	48	0	0.000	paddock adjacent to rail area to east of Station Lane; grassy horse paddock; limited visibility
MM235	spur crest	level-very gentle	>50	1	1	4	1	low	A	300	5	2	6	0	0.000	grassy paddock
MM236	spur crest	level-very gentle	>50	1	1	4	1,2	low	A	1,600	5	2	32	0	0.000	farm land with infrastructure
MM237	simple slope	level-very gentle	>50	1	1	4	1	low	A	2,560	20	10	256	0	0.000	grassy paddock; stand of Casuarina; possibly an elevated flat
MM238	simple slope	gentle	<50	1	1	4	1,2	low	A	1,920	1	0.5	2	0	0.000	dense grass
MM239	drainage depression	gentle	<50	1	1	4,5	1,2,4	low-mod	A	600	5	2	12	0	0.000	dam; modified drainage
MM240	drainage depression	gentle	<50	1	1	4	1	low-mod	A	1,600	5	2	32	0	0.000	dense vegetation, grass; cow/horse paddock; water present
MM241	simple slope	gentle	<50	1	1	4	1	low	A	3,520	1	0.5	4	0	0.000	grassy paddock
MM242	simple slope	gentle	<50	1	1	4	1	low	A	800	5	2	16	0	0.000	dense vegetation, grass; cow/horse paddock; scattered trees
MM243	drainage depression	gentle	<50	1	1	4,5	1	low-mod	A	10,400	5-20	1-10	176	4	0.023	dams; grassy paddock; exposures on dam wall raise visibility levels

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM244	simple slope	gentle	<50	1	1	4	1	low	A	5,600	10	5	280	0	0.000	grassy paddock
MM245	simple slope	gentle	<50	1	1	4	1	low	A/B	4,650	5-90	1-30	119	1	0.008	grassy paddock; ballast track; exposures in paddock
MM246	simple slope	level-very gentle	<50	1	1,2	4	1,2	mod	A	3,600	1	0.5	18	0	0.000	dense grass cover; small areas of exposures but leaf litter obscures visibility; regrowth forest
MM247	simple slope	gentle	<50	1	1	4	1,2	low	A	2,000	5	2	40	0	0.000	scattered Eucalypts; dense leaf litter; dense grass
MM248	simple slope	level-very gentle	>50	1	1	4	1	low	A	2,000	10	5	100	0	0.000	grassy paddock
MM249	drainage depression	gentle	<50	1	1	4,5	1	low	A	800	5	2	16	0	0.000	dam walls; creek line; dense leaf litter and grass
MM250	simple slope	gentle	<50	1	1	4	1,2	low	A	1,000	10	5	50	0	0.000	grassy paddock
MM251	simple slope	gentle	>50	1	1,2	4	1,2	mod	A	5,000	1	0.5	25	0	0.000	dense ground cover; some regrowth; limited visibility; cattle impacts; land has been cleared
MM252	simple slope	gentle	>50	1	1	4,5	1,2	low-mod	A	14,400	5-30	1-20	1512	0	0.000	grassy paddock with scattered Eucalypts; cow paddock; some exposures near trees
MM253	hillock	gentle	>50	1	1,2	4	1,2	mod	A	2,000	1	0.5	10	0	0.000	dense grass cover; limited visibility; impacted by cattle grazing
MM254	simple slope	gentle	>50	1	1,2	4	1,2	mod	A	4000	1	0.5	20	0	0.000	dense grass cover; limited visibility; impacted by cattle grazing
MM255	ridge crest	gentle	<50	1	1	4	1	high	A	700	5	2	14	192	13.714	grass cover; side exposures with artefacts; most artefacts located on southern side of artificial drainage; moderate potential
MM256	simple slope	level-very gentle	<50	1	1	4	1,2	low-mod	A	1,600	10	5	80	0	0.000	Eucalypt forest; higher ground visibility than most survey areas
MM257	simple slope	gentle	<50	1	1	4	1	low	A	3,500	1	0.5	18	9	0.514	dense grass cover; site located on rock outcrop
MM258	drainage depression	gentle	<50	1	1	4,5	1,2	low-mod	A	800	30	20	160	0	0.000	ballast debris; Eucalypt stand; skeletal soils; erosion, colluvial deposits
MM259	simple slope	level-very gentle	<50	1	1,2	4	1,2	mod	A	1,200	0.5	0.5	6	0	0.000	dense grass cover
MM260	simple slope	gentle	>50	1	1	4	1,2	low-mod	A	4,800	1	0.5	5	0	0.000	grassy cow paddock
MM261	spur crest	level-very gentle	>50	1	1	4	1	mod	A	300	0.5	0.5	2	0	0.000	dense grass cover
MM262	simple slope	level-very gentle	<50	1	1	4	1	mod	A	1,800	0.5	0.5	9	0	0.000	dense grass cover
MM263	drainage depression	gentle	<50	1	1	4	1	mod	A	600	1	0.5	3	0	0.000	dense grass cover
MM264	drainage depression	gentle	<50	1	1	4	1,2	low	A	960	1	0.5	1	0	0.000	dense grass; limited visibility
MM265	simple slope	moderate	<50	1	1,2	4	1,2	mod	A	2,400	1	0.5	12	0	0.000	dense grass cover and leaf litter
MM266	simple slope	gentle	<50	1	1	4	1,2	low	A	4,800	5	2	96	0	0.000	dense grass; rolling hills
MM267	spur crest	gentle	>50	1	1,2	4	1	mod	A	240	0.5	0.5	1	0	0.000	dense grass cover
MM268	simple slope	gentle	>50	1	1,2	4	1	mod	A	4,800	0.5	0.5	24	0	0.000	dense grass cover
MM269	drainage depression	gentle	>50	1	1,2	4	1,2	mod	A	600	0.5	0.5	3	0	0.000	dense grass cover
MM270	simple slope	gentle	<50	1	1	4	1	mod	A	7,200	0.5	0.5	36	0	0.000	dense grass cover; low potential for in situ deposit
MM271	drainage depression	level-very gentle	<50	1	2	4	1,2	mod	A	60	1	0.5	1	0	0.000	limited visibility due to dense vegetation; small pond
MM272	hillock	steep	>50	1	1,2	4	1,2	high	A	2,000	1	0.5	10	0	0.000	artificial mound that extends along the survey area; very dense grass and limited visibility; regrowth trees
MM273	simple slope	gentle	<50	1	1	4	1,2	mod	A/B	5,200	1	0.5	26	2	0.077	dense grass cover; very limited visibility; low shrubs; old trotting track provides some exposure

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM274	simple slope	gentle	<50	1	1	4	1,2	low-mod	A	720	5	2	7	0	0.000	dense grass; scattered scrubs; some exposures through grass
MM275	drainage depression	gentle	<50	1	1	4	1,2	low-mod	A	480	5	2	5	0	0.000	dense grass; scattered scrubs; some exposures through grass
MM276	simple slope	gentle	<50	1	1	4	1,2	low	A	360	1	0.5	1	0	0.000	dense grass; scattered scrubs
MM277	flat	level-very gentle	>50	1	1,2	4,5	1,2	high	A/B	12,600	2	0.5	63	0	0.000	road through survey unit; low potential for in situ deposits due to extensive modification; some bush regrowth
MM278	drainage depression	level-very gentle	<50	Stony Ck	2	4	1,2	mod	A	5,600	1	0.5	28	0	0.000	dense riparian vegetation including she-oak and lantana; some land clearance
MM279	simple slope	gentle	<50	Stony Ck	2	4	1,2	mod	A	1,600	1	0.5	8	0	0.000	potentially modified surface from golf course; some exposures under scattered Eucalypts
MM280	simple slope	gentle	<50	Stony Ck	1,2	4	1,2	mod	A	7,200	0.5	0.5	36	1	0.028	dense grass cover; low potential for stratified deposits due to extensive impacts from the rail
MM281	simple slope	level-very gentle	>50	Stony Ck	1	4	1	mod	A	3,600	0.5	0.5	18	0	0.000	dense grass cover
MM282	drainage depression	level-very gentle	<50	Stony Ck	1,2	4	1,2	mod	A	3,000	0.5	0.5	15	0	0.000	very little visibility due to extensive bullrushes; close to Stony Creek
MM283	simple slope	level-very gentle	<50	Stony Ck	1	4	1	mod	A	300	1	0.5	2	0	0.000	dense grass cover
MM284	drainage depression	level-very gentle	<50	Stony Ck	1	4	1	low	A	300	0.5	0.5	2	0	0.000	dense grass cover; high potential for deposits; close to Stony Creek; impacts only include clearing and grazing, potential for *in situ* deposits
MM285	simple slope	steep	<50	Stony Ck	1	4	1	mod	A	1,050	1	0.5	5	0	0.000	grass cover; limited visibility; slope above Stony Creek; moderate archaeological potential
MM286	simple slope	level-very gentle	>50	Stony Ck	1	4	1,2	low	A	1,200	1	0.5	6	0	0.000	Eucalypt forest
MM287	drainage depression	level-very gentle	<50	Stony Ck	1,2	4	1,2	low	A	360	1	0.5	2	0		
MM288	drainage depression	gentle	<50	Went-worth Swamp	1	4	1	high	A	350	1	0.5	2	0	0.000	artificial dam and drainage; low potential
MM289	simple slope	gentle	<50	Went-worth Swamp	1	4	1	mod	A	280	1	0.5	1	0	0.000	dense grass cover; some microtopography
MM290	simple slope	level-very gentle	<50	Went-worth Swamp	1	4	1,2	mod	A/B	2,400	5	2	48	0	0.000	modified in places; fill; grass; scrubby plants
MM291	drainage depression	gentle	<50	Went-worth Swamp	1	4	1,2	mod	A/B	4,000	1	0.5	20	0	0.000	drainage extends into rail corridor and has been modified by rail; vegetation limits visibility
MM292	drainage depression	gentle	<50	Went-worth Swamp	1	3,4	1	mod	A	350	1	0.5	2	0	0.000	drainage channel modified in places; dense vegetation
MM293	simple slope	gentle	<50	Went-worth Swamp	1	4	1	mod	A	1,400	1	0.5	7	0	0.000	dense grass cover
MM294	drainage depression	level-very gentle	<50	Went-worth Swamp	1	4	1	mod	A	350	1	0.5	2	0	0.000	small order drainage running through cattle paddocks; dense grass along banks
MM295	simple slope	gentle	<50	Went-worth Swamp	1	4,5	1,2	low-mod	A/B	6,400	1	0.5	7	0	0.000	grass; very low visibility; mostly modified; opposite to survey area is an air pluger from a closed underground mine - as identified by local resident

MAITLAND TO MINIMBAH - ARCHAEOLOGICAL SURVEY COVERAGE DATABASE

SurveyArea(FinalCode)	Landform Element	Slope	Distance to Water (metres)	Type of Watercourse	Vegetation	LandSurface	DetectionLimitingFactors	Ground Disturbance	Exposure Type (Horizon)	Total Sample Area (m^2)	Surface Visibility (%)	Archaeological Visibility %	Effective Survey Coverage (m^2)	# of Artefacts	Artefact Density/m^2 of Effective Survey Coverage	Comments
MM296	simple slope	gentle	>50	Went-worth Swamp	1	4	1	mod	A	7,000	1	0.5	35	0	0.000	dense grass cover; limited visibility
MM297	drainage depression	level-very gentle	<50	Went-worth Swamp	1	4	1	mod	A	700	0.5	0.5	4	0	0.000	boggy drainage; dense grass cover
MM298	flat	level-very gentle	<50	Went-worth Swamp	1	4	1	mod	A	4,200	1	0.5	21	0	0.000	concentration of tussock grass; grazing grass; limited visibility
MM299	flat	level-very gentle	>50	Went-worth Swamp	4	4,5	1,4	high	A	2,100	1	0.5	11	0	0.000	residential housing; completely modified
MM300	simple slope	gentle	<50	3	1	4	1,2	low-mod	A/B	125	1	0.5	1	0	0.000	slope up to paddock ballast supported; negligible potential
MM301	drainage depression	moderate	<50	Sweet-water Ck	1	1,4	1	high	A/B	1600	30	1	16	2	0.125	spoil mound from dam construction
MM302	simple slope	moderate	<50	Black Ck	1,2	4	1,2	mod	A	12000	1	0.5	60	0	0.000	low dense grass; limited visibility with sporadic small exposures; dense ground cover and lantana to north; western portion of this area has potential
MM303	simple slope	level-very gentle	<50	Sawyers Ck	1	4,5	1,4	high	A/B	4,400	5-90	0.5	22	1	0.045	modern land surface; medium sized road aggregate; ground surface is railway aggregate - not *in situ*
Vegetation: 1 = cleared/grass/crop; 2 = regrowth forest.																
Land Surface: 1 = sheet erosion; 2 = gully erosion; 3 = stream bank erosion; 4 = vegetated; 5 = modified (eg. animals/vehicle track).																
Detection Limiting Factors: 1 = vegetation; 2 = leaf litter/gravel; 3 = sediment deposition; 4 = other																

APPENDIX 3. ABORIGINAL HERITAGE SITE DATABASE AND SITE DESCRIPTIONS

SITE #37-6-0119

See Report 37-6-129

1. Map Name SINGLETON ... GRETA ... 5. Site No. 37-6-119
2. Scale 1:250,000 ... 1:25,000 ... 6. Site type OPEN
3. Grid ref 4
4. Site name(s) LOCHINVAR ... Varley 5 ... 7. Classification
8. Air photo ref
9. Cadastral
10. Land Status ... 11.

37-6-0119

12. Directions for site relocation

SITE DESTROYED

13. Owner ... 14. Tenant/Manager
Address ... Address
Attitude ... Attitude

15. Site Description

five Waste flakes

CONSENT TO DESTROY
ISSUED 370003

16. Reasons for investigation
17. Condition
18. Interpretation
19. Visitation
20. Recommendations +

21. **Environmental description of site locality**

22. **Relation to other sites in locality**

23. **Details of artifact collections**

24. Is plan or diagram of site attached? **Yes/No**

25. Are annotated photographs attached? **Yes/No** **How many?**

26. Other additions

27. Importance of site to Aborigines

28. Source of this information

29. Oral sources of information

30. Written references

31. Recorded by L.K. Byrne **Filed by**

Address

Date **Date** 26-2-07

addit. info

1. Map Name SINGLETON S-1 56-1 Greta 5. Site No. 37-6-119
2. Scale 1:250000 1:25000 6. Site type Q
3. Grid ref .. Surface campsite
4. Site name(s) FARLEY E 7. Classification

8. Air photo ref Nil
9. Cadastral Heddon
10. Land Status Freehold 11.

12. **Directions for site relocation** The stone flake material lay along the service track along the south side of the Main Northern Railway. The grid ref. on the Greta 1:25000 map (9132-I-S).

map c- 30-4-76

13. Owner Alumax	14. Tenant/Manager
Address 416 High Street	Address
Maitland	
Attitude Unknown	Attitude

15. **Site Description** A total of five man-made stone flakes were found along a 20 m stretch of the sandy margin of railway service track. Four of these were rhyolite, one was chert. These materials do not occur in the immediate neighbourhood; they may have come from the alluvials of the Hunter River 5 km distant. The site is on a very ill-defined arm of Stony Creek.

None of the stone flakes had been used.

CONSENT TO DESTROY
ISSUED 370003

16. Reasons for investigation E.I.S. for Alumax aluminium smelter at Farley
17. Condition Disturbed by vehicle traffic
18. Interpretation
19. Visitation ... Frequent farm vehicle traffic
20. Recommendations None

21. **Environmental description of site locality**

The site is on sandy level ground at the foot of a ridge;it lies on the "flood plain" of a dry gully which heads towards Stony Creek.The latter is a permanent stream which flows via marshes to the Hunter River.Stony Creek is bordered by dry schlerophyll forest with much underbrush.The ridge to the south carries a thin scatter of ironbark trees,but otherwise the immediate area has been cleared for cattle grazing.

The area has a modest rainfall,mostly in the summer months.Summers are hot, the winters cool.Wildlife included grey kangaroos,echidnas,dragon lizards.

---

22. **Relation to other sites in locality**

Four other minor scatters of stone flakes were found in the headwaters of Stony creek;the lower creek has not been surveyed.The next creek to the south has ten scatters of stone flakes and there are two large sets of ax-grinding grooves in its bed.The minor creek to the southeast has one scatter of stone flakes and one set of axe-grinding grooves.(See E.I.S. Report for more details).

---

23. **Details of artifact collections** The material was all collected and has been lodged with The Australian Museum.

SITE DESTROYED

---

24. **Is plan or diagram of site attached?** ~~Yes~~/No

25. **Are annotated photographs attached?** ~~Yes~~/No **How many?** Nil

26. **Other additions** Nil

---

27. **Importance of site to Aborigines** Unknown

28. **Source of this information** No local Aborigines were located.

---

29. **Oral sources of information** Nil

30. **Written references** L.K.Dyall, "Report on Aboriginal Relics in Area of Proposed Smelter at Farley,N.S.W." (July 1980)

---

31. **Recorded by** Dr. L.K.Dyall

Filed by

CONSENT TO DEST

ISSUED 3/2/2003

Address University of Newcastle
Shortland N.S.W. 2308

Date 30 October 1979

Date

SITE DESTROYED

CONSENT TO DESTROY
ISSUED 37 0003

C O N S E N T

CONSENT TO CARRY OUT THE DESTRUCTION OF AN ABORIGINAL RELIC/PLACE

NEW SOUTH WALES GOVERNMENT

CONSENT ISSUED UNDER SECTION 90 OF THE
NATIONAL PARKS AND WILDLIFE ACT, 1974 (AS AMENDED)

WHEREAS Aboriginal relics as described in Schedule "A", are situated upon the land described in Schedule "B", and which constitute relics within the meaning of Section 90 of the National Parks and Wildlife Act, 1974 (as amended), and WHEREAS application has been made by:

Hunter Valley Development Company
C/- P.O. Box 27
MAITLAND N.S.W. 2320

for CONSENT to destroy those relics in the course of:

Residential Subdivision

NOW I, JOHN FREDERCIK WHITEHOUSE, Director of National Parks and Wildlife, do HEREBY by virtue of and in pursuance of Section 90 of the said Act, and subject to the Conditions hereunder set out give my CONSENT as requested by the said applicant.

TERMS AND CONDITIONS OF THIS CONSENT

This Consent is issued subject to General Terms and Conditions covering all archaeological Permits and Consents, as well as the Specific Terms and Conditions pertaining to Consents to Destroy Aboriginal Relics all of which conditions are detailed in the attached pages.

DATED at Sydney this day of , 19

Director of National Parks
and Wildlife

SITE #37-6-0120

addit. w/o

1. Map Name ..SINGLETON S-1 56-1 ..Greta..... 5. Site No. 37-6-120
2. Scale .... 1:25,000..... 6. Site type .Isolated finds...
3. Grid ref ....
4. Site name(s)...FARLEY F..... ..... 7. Classification .....

8. Air photo ref .....Nil.....
9. Cadastral .....Heddon.....
10. Land Status .....Freehold..... 11. .....

37-6-0120

12. Directions for site relocation Grid r on the Greta 1:25000 map (9132-I-S).The stone flakes were found singly along 400 m of the service track which runs through the paddock on the south side of the railway.

The grid ref. is a midpoint.

SITE DE[illegible]

map - 38-4-76

13. Owner .....Alumax..... 14. Tenant/Manager.....
Address ...410.High.Street..... Address .....
.....Maitland..... .....
Attitude ...Unknown..... Attitude .....

15. Site Description The stone items were found singly on sandy loam along the vehicle track.They consisted of one waste flake,two used scrapers,and a used blade. The materials (not recorded in detail) were the usual cherts and acid volcanics of the Aboriginal camps of this area,and are probably derived from the alluvials of the Hunter River some 5 km distant.These materials are easily distinguished from the basalt strewn along the railway line and the vehicle track.

The site is close to a minor arm of Stony Creek,and there may well be water in this arm in wet weather.

CONSENT TO DESTROY
ISSUED 3/2003

16. Reasons for investigation .E.I.S. for Alumax aluminum smelter at Farley.....
17. Condition ....Material has been uncovered by vehicle traffic and cattle.....
.....
18. Interpretation .....
19. Visitation .....Frequent.....
20. Recommendations .....Nil.....

21. **Environmental description of site locality**

The site is in a cleared paddock.There is a low ridge behind with a residual cover of dry schlerophyll forest.Stony Creek to the north is permanent;its reedy bed passes through dry schlerophyll forest with a great deal of underbrush.Stony Creek drains via marshes to the Hunter River.

The area has a modest rainfall,mostly in the summer months,which are hot. Winters are cool.

Wildlife in the area includes grey kangaroos,wombats,echidnas,and dragon lizards.

---

22. **Relation to other sites in locality** There are four other minor scatters of man-made flakes of stone in the headwaters of Stony Creek.(The lower creek has not been surveyed).The creek to the southeast had one minor stone flake scatter,and a set of axe-grinding grooves.The parallel creek to the south has ten minor stone flake scatters and two large sets of axe-grinding grooves. (See E.I.S. Report for details).

---

23. **Details of artifact collections** The material was all collected and has been lodged with The Australian Museum.

SITE DESTROYED

---

24. **Is plan or diagram of site attached?** ~~Yes~~/No

25. **Are annotated photographs attached?** ~~Yes~~/No **How many?** Nil

26. **Other additions** Nil

---

27. **Importance of site to Aborigines** Unknown

28. **Source of this information** No local Aborigines were located

---

29. **Oral sources of information** Nil

30. **Written references** L.K.Dyall, "Report on Aboriginal Relics in Area of Proposed Smelter at Farley,N.S.W." (July 1980)

---

31. **Recorded by** Dr.L.K.Dyall

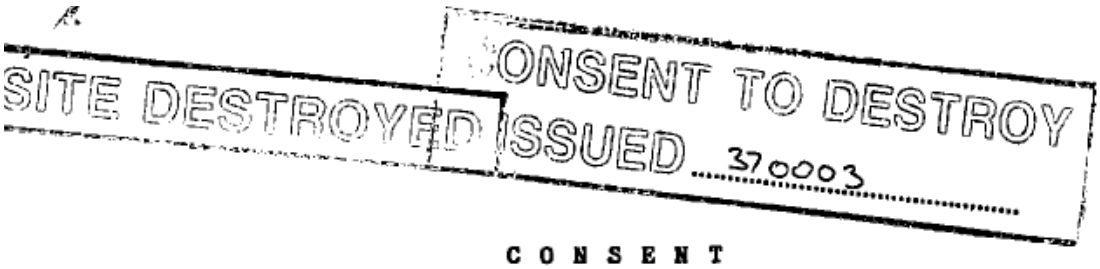
Address University of Newcastle
Shortland N.S.W. 2308

Date 30 October 1979

Filed by

CONSENT TO DESTROY
ISSUED 370003

Date



C O N S E N T

CONSENT TO CARRY OUT THE DESTRUCTION OF AN ABORIGINAL RELIC/PLACE

NEW SOUTH WALES GOVERNMENT

CONSENT ISSUED UNDER SECTION 90 OF THE
NATIONAL PARKS AND WILDLIFE ACT, 1974 (AS AMENDED)

WHEREAS Aboriginal relics as described in Schedule "A", are situated upon the land described in Schedule "B", and which constitute relics within the meaning of Section 90 of the National Parks and Wildlife Act, 1974 (as amended), and WHEREAS application has been made by:

Hunter Valley Development Company
C/- P.O. Box 27
MAITLAND N.S.W. 2320

for CONSENT to destroy those relics in the course of:

Residential Subdivision

NOW I, JOHN FREDERCIK WHITEHOUSE, Director of National Parks and Wildlife, do HEREBY by virtue of and in pursuance of Section 90 of the said Act, and subject to the Conditions hereunder set out give my CONSENT as requested by the said applicant.

TERMS AND CONDITIONS OF THIS CONSENT

This Consent is issued subject to General Terms and Conditions covering all archaeological Permits and Consents, as well as the Specific Terms and Conditions pertaining to Consents to Destroy Aboriginal Relics all of which conditions are detailed in the attached pages.

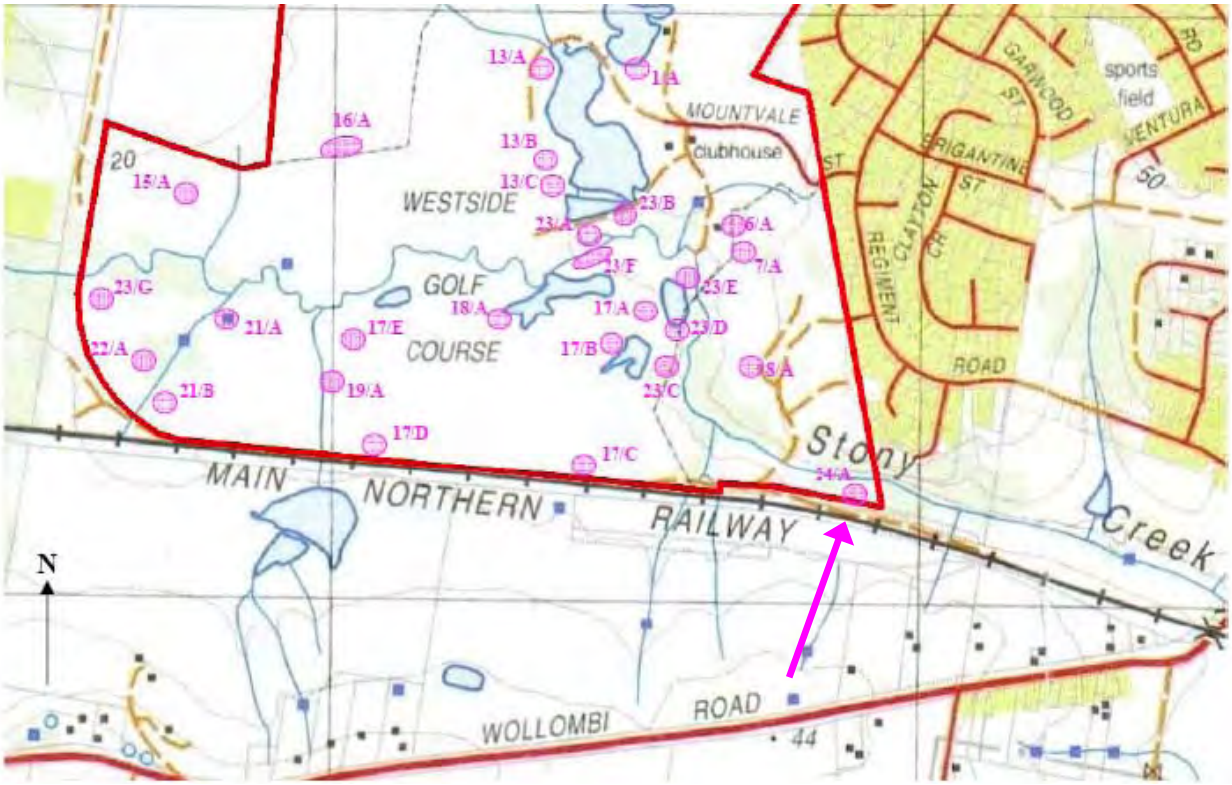
DATED at Sydney this day of , 19

Director of National Parks
and Wildlife

SITE #38-4-0714

Site HG24/A is an isolated artefact located on a moderate to steeply inclined drainage depression (Stony Creek) in the southeast corner of the Heritage Green area. Site HG24/A is situated around AMG grid reference [illegible] on the Maitland 9232-4S 1:25,000 topographic map. It comprises a single artefact, a tuff flake. The evidence was located on a two metre wide vehicle track on the southern side of Stony Creek north of the Main Northern Railway. The site has been subject to high levels of ground disturbance from earthworks associated with construction of the vehicle track and adjacent railway. There is a low potential for sub-surface deposits of artefacts to occur in the A unit soil at the locus or across the broader drainage depression unit, due in part to the high levels of disturbance and moderate-steeply inclined nature of the slope (Kuskie 2004c).

Site Location: #38-4-0714 (Kuskie 2004c)

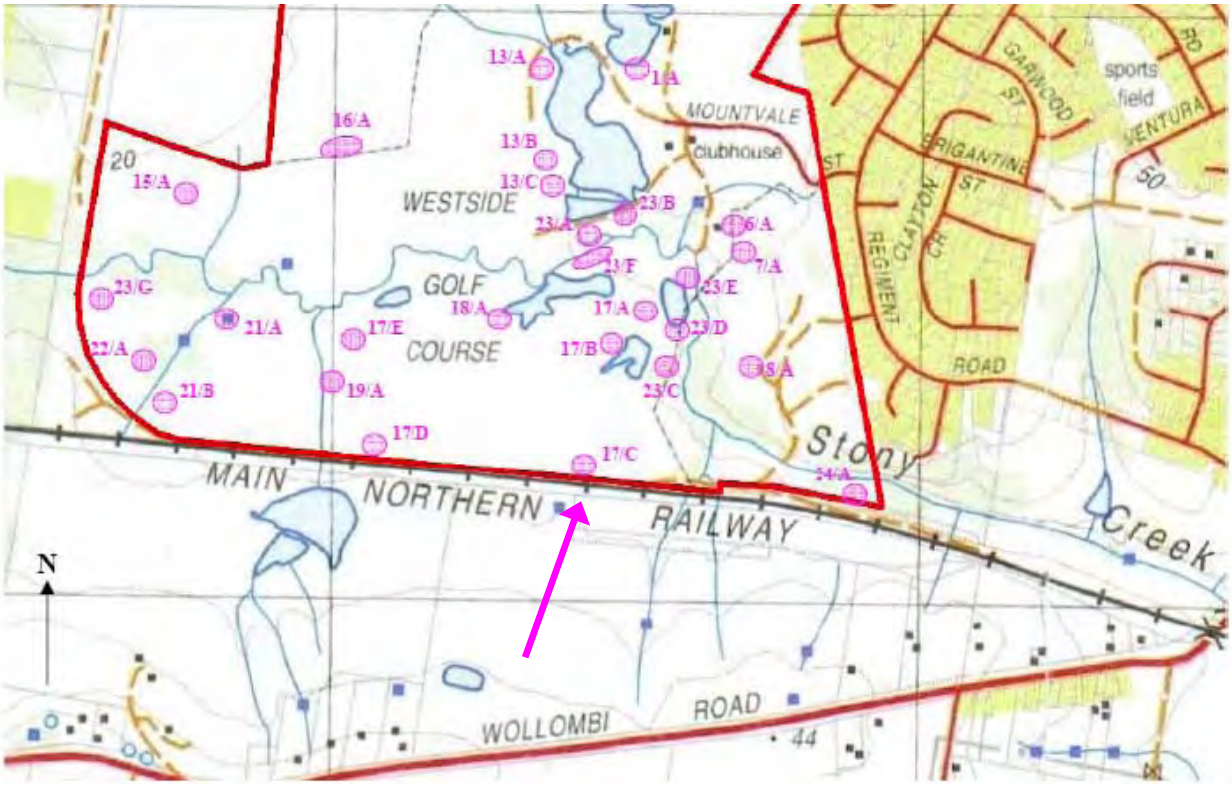


Photograph: #38-4-0714 (Kuskie 2004c)

SITE #38-4-0719

Site HG17/C is an artefact scatter located on a very gently inclined simple slope in the southern portion of the former Westside Golf Course. Site HG17/C is situated around AMG grid reference [illegible] on the Maitland 9232-4S 1:25,000 topographic map. It comprises two artefacts, a silcrete flake portion and a tuff microblade core. The evidence was located within a 32 x 2 metre portion of a 40 x 10 metre exposure, with a mean archaeological visibility of 40%. It is situated on the southern boundary of the Heritage Green area adjacent to the fence bordering the Main Northern Railway and immediately south of the 13th fairway. The exposure has been created by installation of a gas pipeline and development of the golf course. The site has been subject to high levels of ground disturbance from these activities. There is a low potential for sub-surface deposits of artefacts to occur in the A unit soil at the locus or across the broader simple slope unit, due in part to the very shallow nature of this unit as a result of previous ground disturbance (Kuskie 2004c).

Site Location: #38-4-0719 (Kuskie 2004c)

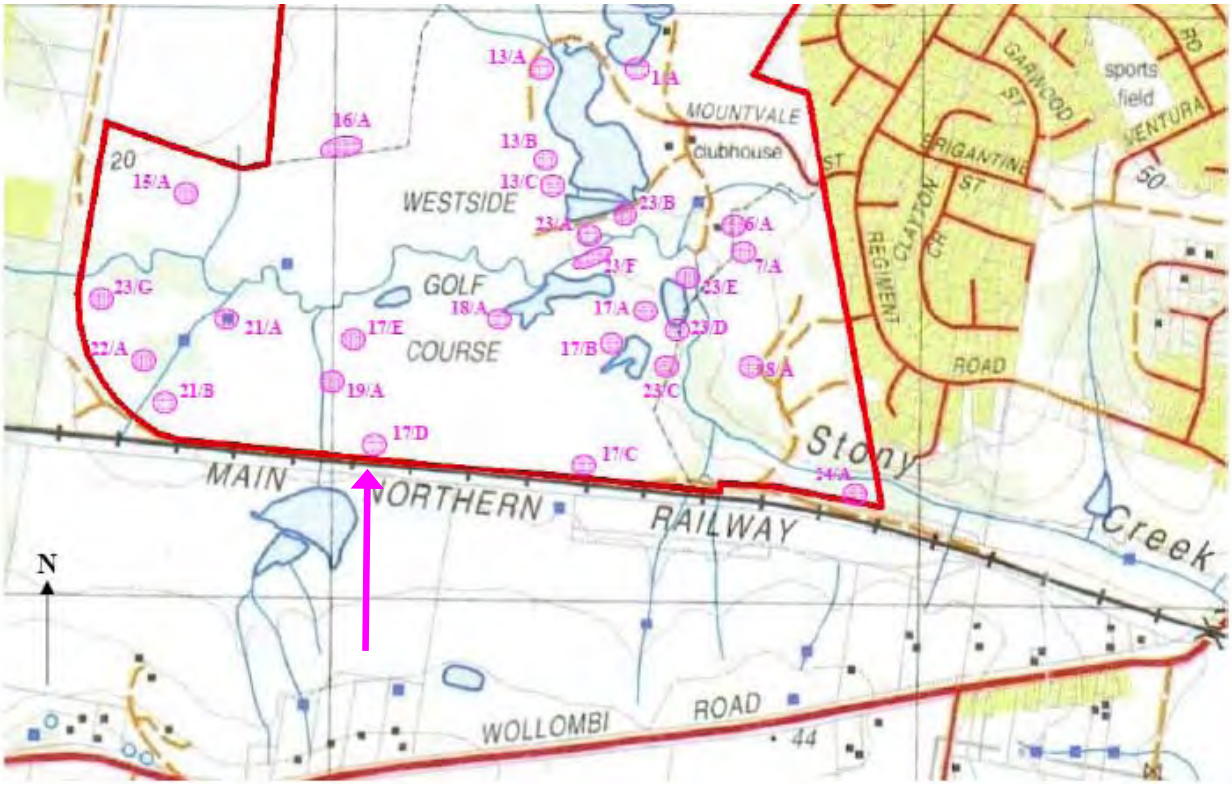


Photograph: #38-4-0719 (Kuskie 2004c)

SITE #38-4-0722

Site HG17/D is an artefact scatter located on a very gently inclined simple slope in the southern portion of the former Westside Golf Course. Site HG17/D is situated around AMG grid reference [illegible] on the Maitland 9232-4S 1:25,000 topographic map. It comprises two artefacts, a tuff flake and a tuff core. The evidence was located within a 30 x 2 metre portion of a 50+ x 4 metre exposure, with a mean archaeological visibility of 10%. The artefacts are situated on spoil mounds associated with a gas pipeline on the southern boundary of the Heritage Green area bordering the Main Northern Railway and immediately south of the 13th fairway. Hence, these items are not *in situ* and their original origin is uncertain. The exposure has been created by installation of a gas pipeline and development of the golf course and the site has been subject to high levels of ground disturbance from these activities. There is a low potential for sub-surface deposits of artefacts to occur in the A unit soil at the locus or across the broader simple slope unit, due in part to the very shallow nature of this unit as a result of previous ground disturbance (Kuskie 2004c).

Site Location: #38-4-0722 (Kuskie 2004c)

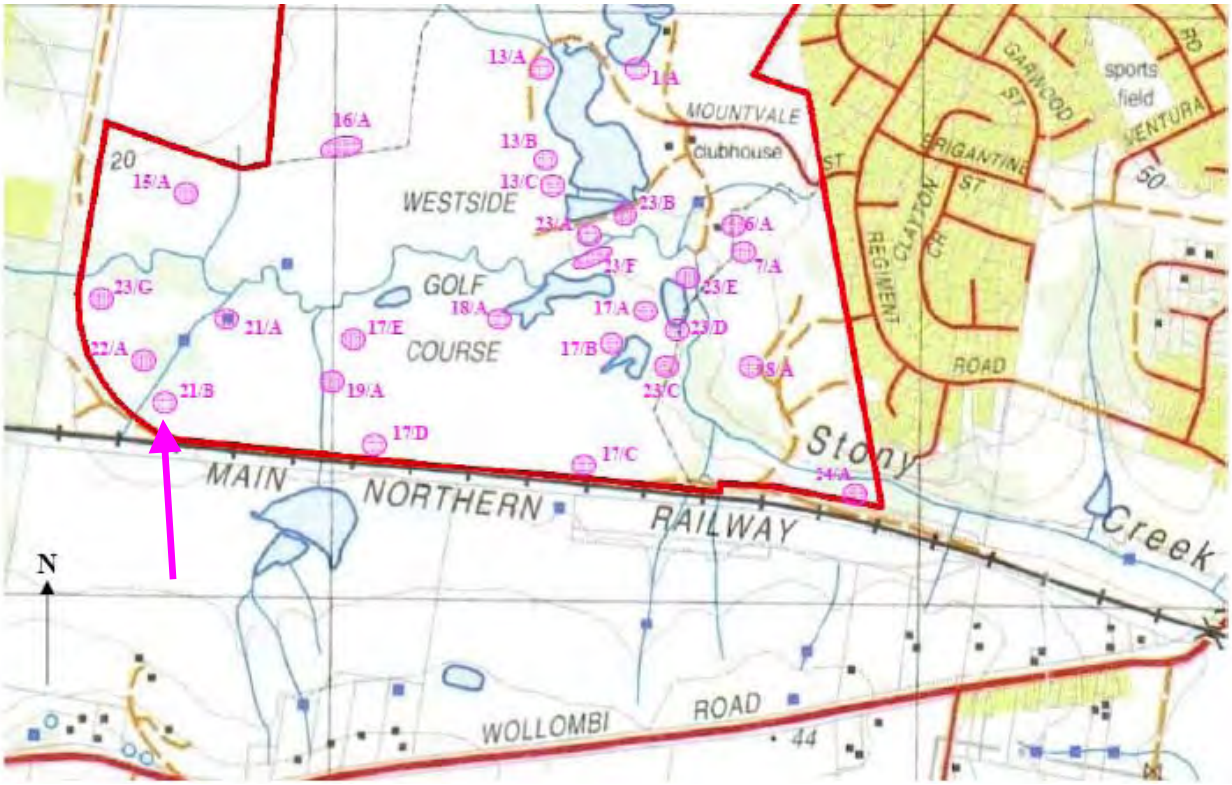


Photograph: #38-4-0722 (Kuskie 2004c)

SITE #38-4-0732

Site HG21/B is an isolated artefact located on a gently inclined drainage depression in the southwest portion of the former Westside Golf Course. Site HG21/B is situated around AMG grid reference on the Maitland 9232-4S 1:25,000 topographic map. A single artefact, a silcrete core, is present. The evidence was located within a small exposure on the eastern side of the drainage depression, on the rough between mown sections of the 15th fairway (Kuskie 2004c). The identified locus has been subject to high levels of ground disturbance from development and maintenance of the golf course. There is a low potential for sub-surface deposits of artefacts to occur in the A unit soil at the locus, due in part to the very shallow nature of this unit as a result of topsoil removal associated with the previous development of the golf course (Kuskie 2004c).

Site Location: #38-4-0732 (Kuskie 2004c)



Photograph: #38-4-0732 (Kuskie 2004c)

SITE #37-6-1315

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Anvil Creek RTA 13 IF	**NPWS Site Number**	37-6-1315
Owner/manager	Misthold Pty Ltd		
Owner Address	Christopher Richards Secretary 26 Wyoming Road Wyoming 2250		
Location	The site is located on a vehicle track, under a power line just south of the Main Northern Railway, 300 m west of the Branxton railway station and 650m south of the New England Highway. It is 900m NW of Anvil Creek RTA 12 IF		
How to get to the site	See Figure.		37-6-1315
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Easting**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	196	**Parish**	Branxton
Site type(s)	Isolated find	**Site type code (NPWS use only)**	

Description of site and contents
CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

One artefact was located a gentle lower slope, on a two wheel vehicle track, between the Great Northern Railway line and a set of power lines, approximately 300 m west of Branxton railway station. The slope has a northeasterly aspect with a gradient of less than one degree. The artefact was sitting on the southern side of the road in light brown sandy soil that has washed onto the road. Visibility on the two metre width of road averaged 20% due to aggraded soil and grass cover. The area is disturbed from construction of the power line, vehicle use and slashing.

Artefact details:

Type: broken flake (proximal end)
Raw Material: mudstone
Length: 31 mm
Width: 29 mm
Thickness: 8 mm
Colour: cream
Cortex: 90%

The artefact displayed a high degree of patination and a high percentage of pebble cortex.

PAD: It was assessed that the area did not have potential to contain archaeological deposits due to the skeletal soils and disturbed nature of the site.

Version: June 1998 Data entered by: Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	Lower slope	**Aspect**	NE	**Slope**	<1 degrees
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and volcanics.	**Land use/effect**	Clearing, vehicle track, power easement, just south of railway line		
Distance from drinking water	200 m SW of the headwater of a northwesterly flowing tributary of Anvil Creek	**Source**	Anvil Creek		
Resource zone (eg. estuarine, river, forest)	Forest	**Vegetation**	Regrowth Eucalypt forest - box, spotted gum, iron bark, Melaleuca depauperate midstorey, grass and Lomandra understorey		
Edible plants	Box trees, Melaleuca, Casuarina, Lomandra, kangaroo grass	**Faunal resources** (include shellfish)	goannas, black snake, kangaroo		
Other exploitable resources (eg. ochre)	Stone from conglomerate could be useful for flaking stone artefacts and volcanics for axe manufacture.				
Are there other sites in the locality	No	**Are they in the Sites Register**	No	**Other site types include**	

Site condition	Very disturbed	Artefact found on a vehicle track under a power line	
Management recommendations	Apply to NPWS for a Section 90 permit with salvage to collect surface artefact		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Mr Rodney Jackson Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Road Bulga 2330 Ms Ann Hickey Barkuma Neighbourhood Centre 76 Lang Street Kurri Kurri 2327 Ms Megan Hartley and Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

			Mr Chris Turnbull Wonnarua Nation Aboriginal Corporation PO Box 3066 Singleton 2330 Mr Trevor Kennedy Mindaribba Local Aboriginal Land Council PO Box 453 Maitland 2320

Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	22 January, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

FIGURE 5.7
Black Creek Catchment
Anvil Creek Catchment
Black Creek Catchment
Anvil Creek
New England Highway
Branxton
Anvil Creek RTA 13
Black Creek RTA 2
PAD 20
Black Creek RTA 3
Black Creek RTA 1 (37-6-0085)
New Northern Railway
Legend

PLATE 1
Anvil Creek RTA 13 IF

1862/R04/Site Cards/Plates/Anvil Creek RTA 13 IF

SITE #37-6-1324

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Anvil Creek RTA 22	**NPWS Site Number**	37-6-1324
Owner/manager	KF & J Thomas		
Owner Address	Keith & Jennifer Thomas "Holmleigh" Cessnock Road Branxton 2335		
Location	The site is located approximately 20m S of the Main Northern Railway and 600m E of the intersection of Allendale Road and the Main Northern Railway. It is 650m NW of Anvil Creek RTA 21		
How to get to the site	See Figure.		37-6-1324
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Easting**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	196	**Parish**	Stockrington
Site type(s)	Artefact scatter	**Site type code (NPWS use only)**	

Description of site and contents
CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

Two artefacts were located on a road under the power line, 50 m apart on the floodplain east of a northerly flowing tributary of Anvil Creek. One artefact was 150 m east of the watercourse, the second artefact was 50 m to the west of the first artefact at AM . The site has a northerly aspect with less than one degree gradient. Soils consisted of brown sandy loam.

Vegetation has been recently bulldozed. The artefacts were found in areas of exposure where the grass has not regrown as yet. Visibility averaged 20% in an area of 200 m x 50 m. Artefacts consisted one silcrete flake and one broken mudstone flake.

The area is highly disturbed from construction of the power line, vehicle traffic, bulldozed vegetation and top soil, slope wash and the grass is regularly slashed.

PAD: The area is assessed as unlikely to contain potential archaeological deposits in a stratified context due to the disturbed nature of the site.

Version: June 1998 Data entered by: Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	Floodplain	**Aspect**	N	**Slope**	<1 degree
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and volcanics.	**Land use/effect**	Site located on a vehicle track on a power easement		
Distance from drinking water	150 m east of a tributary of Anvil Creek	**Source**	Anvil Creek		
Resource zone (eg. estuarine, river, forest)	Forest	**Vegetation**	Cleared Eucalypt forest with grassy understorey		
Edible plants	Lomandra, amulla, Casuarina, kangaroo grass	**Faunal resources** (include shellfish)	goannas, black snake, kangaroo		
Other exploitable resources (eg. ochre)	Stone from conglomerate could be useful for flaking stone artefacts and volcanics for axe manufacture. Sandstone was outcropping in the creek and water was flowing at the time of survey				
Are there other sites in the locality	Yes	**Are they in the Sites Register**	No	**Other site types include**	Artefact scatter

Site condition	Disturbed	Artefacts found on a road, trees have been bulldozed in the area.	
Management recommendations	Apply to NPWS for a Section 90 permit with salvage to collect surface artefacts and to subsurface salvage/test.		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☒	**Consent issued**	☐
Date of issue		***Consent number***	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Ms Ann Hickey Barkuma Neighbourhood Centre 76 Lang Street Kurri Kurri 2327 Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325 Mr Chris Tumbull and Mr David Jackson Wonnarua Nation Aboriginal Corporation PO Box 3066 Singleton 2330

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	28 January, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

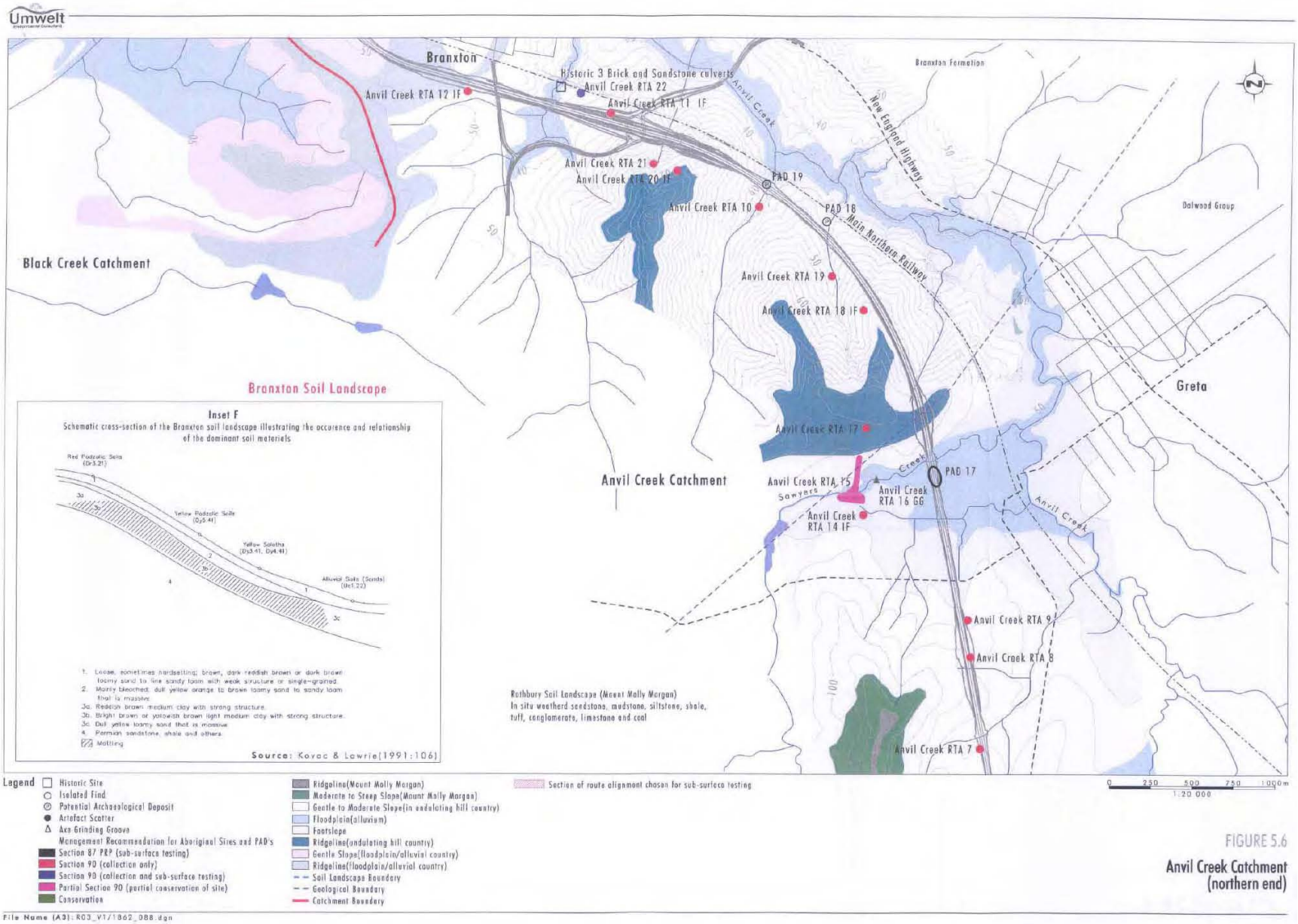


FIGURE 5.6
Anvil Creek Catchment (northern end)

PLATE 1
Anvil Creek RTA 22

SITE #37-6-1339

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Black Creek RTA 2	**NPWS Site Number**	37-6-1339
Owner/manager	N/A		
Owner Address			
Location	The site is located on the western bank of Black Creek, 20 m south of the New England Highway, 2.25 kms west of the township of Branxton, south of Singleton, Hunter Valley, NSW.		
How to get to the site	See Figure.		
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Eastin**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	138	**Parish**	Branxton
Site type(s)	Artefact scatter	**Site type code (NPWS use only)**	

37-6-1339

Description of site and contents
CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

Over 50 artefacts were located, extending for 50 m to the west to AMG
Artefacts were located in a trench (RTA drain) that has been excavated on the western bank of Black Creek, south of the New England Highway. The trench runs parallel with the New England for a length of 500 m with a width of 10 m, a depth of 2 metres. The sides of the trench slope down to a cement strip in the centre. The dominant artefact types were flakes, broken flakes and cores with a small number of retouched flakes. The dominant raw material was silcrete and mudstone. See Table 1 (attached) for details of a sample of the artefacts. The area of the site could not be determined accurately because of poor visibility away from the trench. Visibility within the trench was 50 m x 5 m @ 50% although restricted by a thick vegetation cover of predominantly fennel. Artefacts are eroding out of the A2 soil horizon and have washed into the trench. There is >50 cm of A 2 horizon remaining in the site.

The site is situated on the second creek terrace of Black Creek. Black Creek is deeply incised with running deep water and sandstone outcropping on the banks and in the bed further upstream. The area is very disturbed by tree clearing, construction of the highway and bridge and a drainage trench has been excavated through the site. Scouring has occurred on the banks of the trench and along the creek banks.

PAD: Excavation of the trench has given insight into the soil profile. The area adjacent to the trench has good potential for containing archaeological deposits in a stratified context. The landscape consists of a first and second creek terrace immediately to the south of the trench, which would allow a significant investigation into the Aboriginal use of the area.

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	Creek terrace	**Aspect**	360 degrees	**Slope**	0 degrees
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and volcanics.	**Land use/effect**	Ploughed and cleared paddock, used for grazing cattle		
Distance from drinking water	20 m west of Black Creek	**Source**	Black Creek		
Resource zone (eg. estuarine, river, forest)	Forest	**Vegetation**	Grassland in paddock and introduced plants Casuarina, box, spotted gum along creek line		
Edible plants	Box trees, Casuarina	**Faunal resources** (include shellfish)	goannas, black snake, kangaroo		
Other exploitable resources (eg. ochre)	Stone from conglomerate could be useful for flaking stone artefacts and volcanics for axe manufacture. Sandstone could be useful for sharpening stone axes				
Are there other sites in the locality	Yes	**Are they in the Sites Register**	Yes	**Other site types include**	Artefact scatter

Site condition	Very disturbed	Artefacts found in a drainage trench, south of the New England Highway and west of a traffic bridge	
Management recommendations	Apply to NPWS for a Section 90 permit with salvage to collect surface artefacts and to undertake sub-surface investigation		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Mr Rodney Jackson Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Road Bulga 2330 Ms Ann Hickey Barkuma Neighbourhood Centre 76 Lang Street Kurri Kurri 2327 Ms Megan Hartley and Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325 Mr Chris Tumbull

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

			Wonnarua Nation Aboriginal Corporation PO Box 3066 Singleton 2330 Mr Trevor Kennedy Mindaribba Local Aboriginal Land Council PO Box 453 Maitland 2320
Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	22 January, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

Umwelt
Anvil Creek Catchment
Anvil Creek
Branxton Formation
New England Highway
Branxton
Anvil Creek RTA 13 IF
Black Creek
Black Creek RTA 2
PAD 20
Black Creek RTA 3
Black Creek RTA 1 (37-6-0685)
Main Northern Railway
Black Creek Catchment
0 250 500 750 1000m
1:20 000
Legend
Historic Site
Isolated Find
Potential Archaeological Deposit
Artefact Scatter
Axe Grinding Groove
Management Recommendation for Aboriginal Sites and PAD's
Section 87 PAP (sub-surface testing)
Section 90 (collection only)
Section 90 (collection and sub-surface testing)
Partial Section 90 (partial conservation of site)
Conservation
Floodplain(alluvium)
Low Ridgeline/Spur Crest(floodplain/alluvial country)
Gentle Slope(floodplain/alluvial country)
Gentle to Moderate Slope(in undulating hill country)
Footslope
Soil Landscape Boundary
Geological Boundary
Catchment Boundary
Section of route alignment chosen for sub-surface testing
File Name (A3): 803_V1/1862_089.dgn
FIGURE 5.7
Black Creek Catchment

PLATE 1
Black Creek RTA 2

SITE #37-6-1340

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional information ☐

Site name	Black Creek RTA 3	**NPWS Site Number**	37-6-1340
Owner/manager	RTA		
Owner Address	59 Darby Street Newcastle		
Location	The site is 250m north of the Main Northern Railway, 150m S of the New England Highway and 350m W of Black Creek. It is 500m W of Black Creek RTA 1		
How to get to the site	See attached Figure.		37-6-1340
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Easting**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	139	**Parish**	Branxton
Site type(s)	Artefact scatter	**Site type code (NPWS use only)**	

Description of site and contents
CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

The site is situated 100 m north of a house, 150 m south of the New England Highway, on a third creek terrace, 350 m west of Black Creek and north of the township of Branxton in the Hunter Valley, NSW.

Three artefacts were located in an area 5 m x 2 m on a gravel vehicle track between two fence lines on a third creek terrace. The mudstone artefacts consisted of one broken retouched flake, one flaked piece and one flake (broken in three). The artefacts may have been brought in with the gravel. Exposure on the vehicle track was limited to 50 m x 2 m @ 20% due to grass cover and gravel. The site is partially destroyed by past tree clearing, cultivation, vehicle traffic, construction of fences, and it is likely that the artefacts may have been brought in with a load of gravel for the road.

PAD: The site is situated on a third terrace that contains alluvial deposits. While the road is too disturbed for sub-surface investigation, the surrounding area and the third terrace to the east are likely to contain archaeological deposits below the plough zone.

Version: June 1998 Data entered by: Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	Third creek terrace	**Aspect**	360	**Slope**	Nil
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and basalt	**Land use/effect**	Cattle pastures, gravel road		
Distance from drinking water	340 m west of Black Creek	**Source**	Black Creek		
Resource zone (eg. estuarine, river, forest)	Forest	**Vegetation**	Grassland		
Edible plants		**Faunal resources** (include shellfish)	goannas, black snake, kangaroo, tortoise		
Other exploitable resources (eg. ochre)	Stone from conglomerate could be useful for flaking stone artefacts.				
Are there other sites in the locality	Yes	**Are they in the Sites Register**	No	**Other site types include**	Artefact scatter

Site condition	Partially destroyed	The site is located in a graded drain, under a power line.	
Management recommendations	Apply to NPWS for a Section 90 permit with salvage to collect surface artefact and sub-surface investigation of adjacent creek terrace.		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☒	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Ms Ann Hickey Barkuma Neighbourhood Centre *76 Lang Street* Kurri Kurri 2327 Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325 Ms Maree Waugh Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Road Bulga 2330

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	2 March, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

Anvil Creek Catchment
Anvil Creek
Branxton Formation
New England Highway
Branxton
Anvil Creek RTA 13 IF
Black Creek
Black Creek RTA 2
PAD 20
Black Creek RTA 3
Black Creek RTA 1 (37-6-0685)
Main Northern Railway
Black Creek Catchment
FIGURE 5.7
Black Creek Catchment
Legend
Historic Site
Isolated Find
Potential Archaeological Deposit
Artefact Scatter
Axe Grinding Groove
Management Recommendation for Aboriginal Sites and PAD's
Section 87 PRP (sub-surface testing)
Section 90 (collection only)
Section 90 (collection and sub-surface testing)
Partial Section 90 (partial conservation of site)
Conservation
Floodplain(alluvium)
Low Ridgeline/Spur Crest(floodplain/alluvial country)
Gentle Slope(floodplain/alluvial country)
Gentle to Moderate Slope(in undulating hill country)
Footslope
Soil Landscape Boundary
Geological Boundary
Catchment Boundary
Section of route alignment chosen for sub-surface testing
File Name (A3): R03_V1/1842_069.dgn

PLATE 1
Black Creek RTA 3

SITE #37-6-1370

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

37-6-1370
New Recording ☒ Additional information ☐

Site name	PAD18	**NPWS Site Number**	37-6-1370
Owner/manager	CT Hedges & PE Holz		
Owner Address	Carol Hedges 51 Walkers Hill Lane Harpers Hill 2321		
Location	The PAD is located 150 m west of the Main Northern Railway, 700 m south-west of the New England Highway and 1000m west of Greta..		
How to get to the site	See Figure.		
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Eas**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	203	**Parish**	Branxton
Site type(s)	PAD	**Site type code (NPWS use only)**	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	The PAD is located on the footslope on the western side of a northerly flowing tributary of Anvil Creek. The area has been impacted by tree clearance and grazing but is in relatively good condition. An isolated find was located 300 m to the south on an access track in this same landform unit. Visibility within the PAD was zero due to grasscover.		

Version: June 1998 Data entered by: Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	footslope	**Aspect**	SE	**Slope**	<1 degree
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and volcanics.	**Land use/effect**	Tree clearnce and grazing		
Distance from drinking water	0 m west of an ephemeral 1st order tributary of Anvil Creek	**Source**	Anvil Creek		
Resource zone (eg. *estuarine, river, forest*)	Forest	**Vegetation**	Regrowth Eucalypt forest with Acacia *mid storey and grass understorey*		
Edible plants	Acacia, Lomandra, grass tree, kangaroo grass	**Faunal resources** (include shellfish)	goannas, black snake, kangaroo, wallaby		
Other exploitable resources (eg. ochre)	Stone from conglomerate could be useful for flaking stone artefacts and volcanics for axe manufacture.				
Are there other sites in the locality	Yes	**Are they in the Sites Register**	No	**Other site types include**	Artefact scatter

Site condition	Disturbed		
Management recommendations	Apply to NPWS for a Section 87 PRP to subsurface test the area to be impacted by highway link construction.		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☒	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Ms Ann Hickey Barkuma Neighbourhood Centre 76 Lang Street Kurri Kurri 2327 Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325 Mr Chris Turnbull and Mr David Jackson Wonnarua Nation Aboriginal Corporation PO Box 3066 Singleton 2330

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	27 January, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

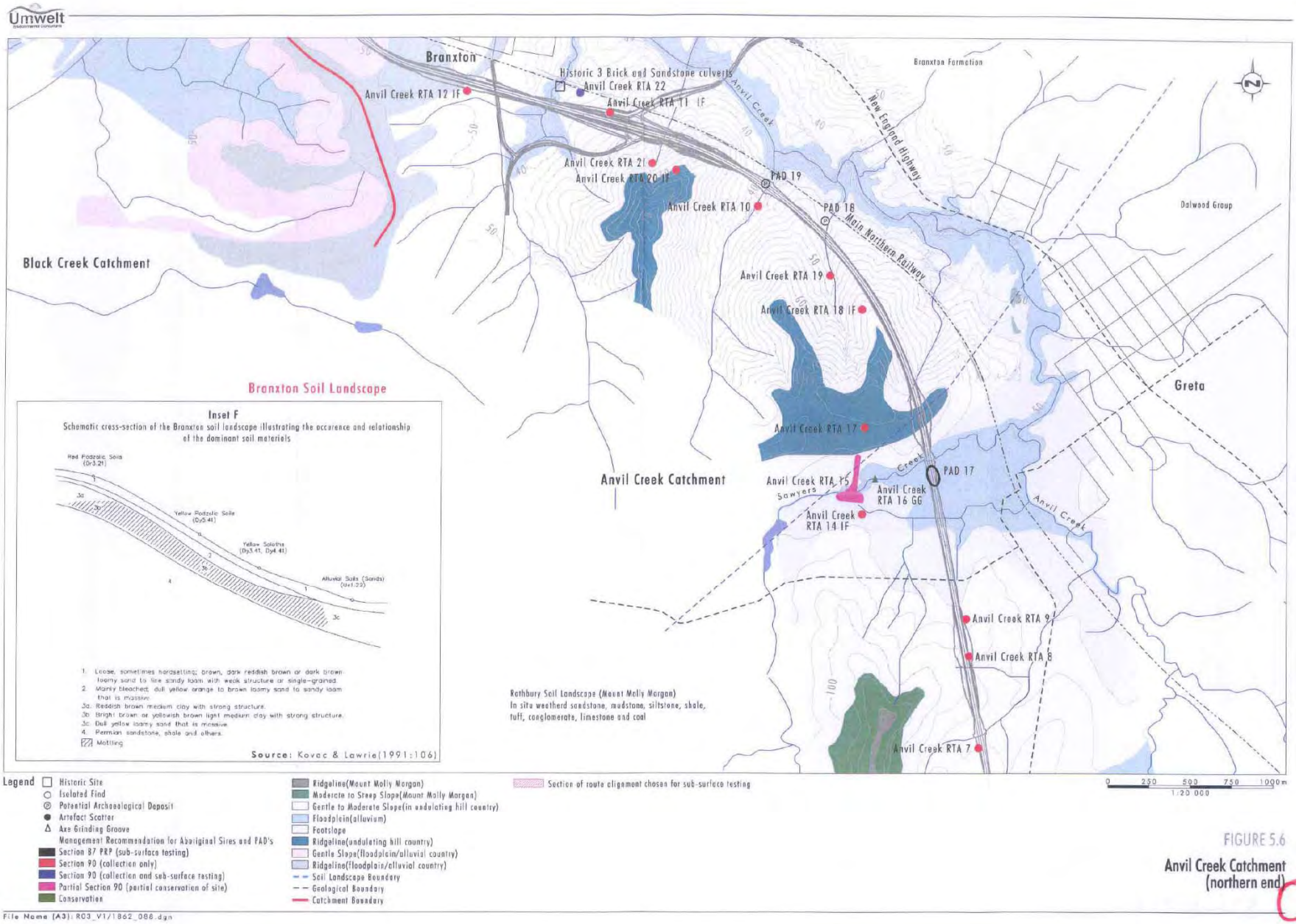


FIGURE 5.6
Anvil Creek Catchment (northern end)

SITE #37-6-1371

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

37-6-1371

New Recording ☒ Additional information ☐

Site name	PAD20	**NPWS Site Number**	37-6-1371
Owner/manager	RTA		
Owner Address	59 Darby Street Newcastle 2300		
Location	The PAD is located directly to the west of the Black Creek Bridge 1800 m west of Branxton. The PAD is on the western side of Black Creek and on the southern side of the New England Highway		
How to get to the site	See Figure.		
1:250,000 map name	Singleton	**NPWS map code**	
AMG Zone	56 **AMG Easting**	**AMG Northing**	
Method for grid reference	Hand-held GPS **Map scale (if method = map)** 1:25,000 **Map name**		Greta 9132-1-S
NPWS District Name (see map)	Central	**NPWS Zone (see map)**	Sydney Zone
Portion no.	138	**Parish**	Branxton
Site type(s)	PAD	**Site type code (NPWS use only)**	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	The PAD extends across the first, second and third creek terraces on the western side of Black Creek. To the north of this area there is a drain that has been excavated into the creek terraces and that runs parallel to the New England Highway. More than 50 artefacts were located eroding from the section of the drain that cut through the second creek terrace. The artefacts are eroding out of the A2 soil horizon and have washed into the trench. Black Creek is deeply incised into its channel (up to 15 m) and retains a permanent supply of water in deep pools. The area identified as PAD has been cleared and cultivated, however, the depth of the soil profile suggests that artefactual material may be located beneath the plough zone in this area. Visibility within the area identified as PAD (within the farmland south of the New England Highway) was zero due to grasscover.		

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

Land form	Creek terraces	**Aspect**	360 degrees	**Slope**	0 degrees
Mark position of the site					
Local rock type	Sandstone, siltstone, conglomerate and volcanics.	**Land use/effect**	Ploughed and cleared paddock, used for grazing cattle		
Distance from drinking water	0 m west of Black Creek	**Source**	Black Creek		
Resource zone (eg. estuarine, river, forest)	Riparian	**Vegetation**	Grassland in paddock and introduced plants Casuarina, box, spotted gum along creek line		
Edible plants		**Faunal resources** (include shellfish)	goannas, black snake, kangaroo, wallaby		
Other exploitable resources (eg. ochre)	*Stone from conglomerate* could be useful for flaking stone artefacts and volcanics for axe manufacture. Sandstone could be useful for sharpening stone axes				
Are there other sites in the locality	Yes	**Are they in the Sites Register**	Yes	**Other site types include**	Artefact scatter

Site condition	Good		
Management recommendations	Apply to NPWS for a Section 87 PRP to undertake subsurface testing in areas to be impacted by highway link construction.		
Have artefacts been removed from site		**When**	
By whom		**Deposited at**	
Consent applied for	☒	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Route alignment investigation for the proposed F3 to Branxton Highway Link		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	**Names and addresses**	Mr Rodney Jackson Lower Wonnarua Tribal Consultancy Pty Ltd 156 The Inlet Road Bulga 2330 Ms Ann Hickey Barkuma Neighbourhood Centre 76 Lang Street Kurri Kurri 2327 Ms Megan Hartley and Ms Hazel Bradford Black Creek Aboriginal Corporation 6a Cumberland Street Cessnock 2325 Mr Chris Tumbull Wonnarua Nation Aboriginal Corporation

Version: June 1998	Data entered by:	Date entered:

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

			PO Box 3066 Singleton 2330 Mr Trevor Kennedy Mindaribba Local Aboriginal Land Council PO Box 453 Maitland 2320
Is the site important to local Aborigines	Yes		
Verbal/written reference sources	Umwelt (Australia) Pty Limited. (in prep.) Proposed National Highway Link F3 to Branxton Aboriginal Heritage Route Alignment Inspection.	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	1
Site recorded by	Leila McAdam	**Date of recording**	22 January, 2004
Address/institution	Umwelt (Australia) Pty Limited, 2/20 The Boulevarde, TORONTO, 2283		

Version: June 1998	Data entered by:	Date entered:

Anvil Creek Catchment
Anvil Creek
Branxton Formation
New England Highway
Branxton
Anvil Creek RTA 13 IF
Black Creek
Black Creek RTA 2
PAD 20
Black Creek RTA 3
Black Creek RTA 1 (37-6-0685)
Main Northern Railway
Black Creek Catchment
0 250 500 750 1000m
1:20 000
FIGURE 5.7
Black Creek Catchment
Legend
Historic Site
Isolated Find
Potential Archaeological Deposit
Artefact Scatter
Axe Grinding Groove
Management Recommendation for Aboriginal Sites and PAD's
Section 87 PRP (sub-surface testing)
Section 90 (collection only)
Section 90 (collection and sub-surface testing)
Partial Section 90 (partial conservation of site)
Conservation
Floodplain(alluvium)
Low Ridgeline/Spur Crest(floodplain/alluvial country)
Gentle Slope(floodplain/alluvial country)
Gentle to Moderate Slope(in undulating hill country)
Footslope
Soil Landscape Boundary
Geological Boundary
Catchment Boundary
Section of route alignment chosen for sub-surface testing
File Name (A3): R03_V1/1842_069.dgn

SITE #37-6-1665

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220
Standard Site Recording Form

New Recording ☒ Additional Information ☐

SITE IDENTIFICATION

Site name	GVE-2	NPWS Site Number	37-6-1665
Owner/manager	Greta Estates Pty Ltd		
Owner Address			

LOCATION

Location	Area located to the south of Greta, bounded by Northern Railway, Allandale Road and Camp Road. Access from main gate on Camp Road (key required).		
How to get to the site	Follow main road for 100m, turn left onto secondary road that leads to northern section of area. Cross paddock towards train line, site is track (exposure) parallel to train line.		
1:250,000 map name	Greta 9232-I-S	NPWS map code	
AMG Zone	56 AMG Easting	AMG Northing	
Method for grid reference	Hand-held GPS Map scale (if method = map)	Map name	
NPWS District Name (see map)		NPWS Zone (see map)	
Portion no.		Parish	

SITE DESCRIPTION

Site type(s)	Open Camp Site	Site type code (NPWS use only)	
Description of site and contents CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock. DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types. ART: area of decorated surface, motifs, colours, wet/dry pigment, engraving technique, no. of figures, sizes, patination. BURIALS: number & condition of bone, position, age, sex, associated artefacts. TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth. QUARRIES: rock type, debris, recognisable artefacts, percentage quarried	Site is an surface artefact scatter contained within access track (dirt road) parallel to rail line. Start site: End site: All recorded artefacts contained within exposure of access track (no more than 5 metres in width). No definable concentrations within the scatter, low density distribution. Maximum density within site - 3 artefacts per meter square. Fragmented silcrete - 3 Fragmented fine grained silicaous - 9		

Version: June 1998 Data entered by: M. Green Date entered: 03-11-2006

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

SITE ENVIRONMENT

Land form	Hillslope	Aspect		Slope	less than 1%
Mark position of the site					
Local rock type	Fine grained siliceous and silcrete materials occur within creeklines of area.	Land use/effect	Grazing. Former army camp.		
Distance from drinking water	150 metres	Source	Anvil Creek		
Resource zone (eg. estuarine, river, forest)		Vegetation	Cleared. Formerly savannah woodland of box, gum and ironbark.		
Edible plants		Faunal resources (include shellfish)			
Other exploitable resources (eg. ochre)					
Are there other sites in the locality	Yes	Are they in the Sites Register	Yes	Other site types include	Open Camp Sites. Isolated Finds.

SITE MANAGEMENT

Site condition	Very disturbed	Artefacts contained within access track exposure, disturbed from vehicle movement and stock movement. Proximity to rail line evidenced by scatter of imported stone (XX).	
Management recommendations			
Have artefacts been removed from site	No	When	
By whom		Deposited at	
Consent applied for	☐	Consent issued	☐
Date of issue		Consent number	

SITE INSPECTION AND RECORDING

Reason for investigation	Archaeological Assessment: Greta Estates Village proposal		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present ☐ Contacted but not present	Names and addresses	Mindaribba Local Aboriginal Land Council PO Box 401, East Maitland, NSW 2323 Rick Griffiths, Gordon Griffiths, Stephen Talbott Lower Hunter Wonnarua Council 31 St Andrews St, Maitland NSW 2320 Barry Anderson, Tracey Skene, John Waters
Is the site important to local Aborigines			
Verbal/written reference sources		ASR report number(s)	C- C-

Version: June 1998 Data entered by: Date entered:

IMPLEMENT RECORDING FORM																				
SITE: GVE-2									DATE: 23/09/02									RECORDER/S: NORMA RICHARDSON		
Implement Type					Raw Material				Implement Length					Implement Width						
	BA	UP	HS	GD	Fgs	Sl	Ch	Qtz	<1	1-3	6-10	11-15	>15	<1	1-3	6-10	11-15	>15	Cortex, %	Broken
1			X		X						X				X				75-100	
TOTALS	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	NA	0

ARTEFACT RECORDING FORM																				
SITE: GVE-2									DATE: 23/09/02									RECORDER/S: NORMA RICHARDSON		
Artefact Type					Raw Material				Artefact Length					Artefact Width						
	Fl	C	R.Fl	FP	Fgs	Sl	Ch	Qtz	<1	1-3	6-10	11-15	>15	<1	1-3	6-10	11-15	>15	Cortex, %	Broken
1	X				X						X				X				25-50	
2				X	X					X					X				25-50	
3			X			X					X				X				1-25	
4	X				X					X				X					75-100	
5		X				X				X					X				0	
6	X				X					X					X				0	
7	X				X					X					X				Double patenated	
8			X		X						X				X				Double patenated	X
9	X				X						X				X				Double patenated	X
TOTALS	5	1	2	1	7	2	0	0	0	5	4	0	0	1	8	0	0	0	NA	2

ATTACHMENT "S"

Application for a Section 90 Consent or a Section 87(1) permit under the National Parks and Wildlife Act, 1974.

IMPORTANT: Complete a separate attachment for each site (Aboriginal object or Aboriginal place)

National Parks and Wildlife Service Site #: 37-6-1665
(if new site(s) attach completed site forms)

Site Name: 1-GVE-2 GRETA VILLAGE ESTATE - 2 (GVE-2)

Street Address: CAMP RD, Near Greta NSW

Property name or locality: Anvil Creek / Former Army & Migrant Camp

Portion number: 1036992 Parish: Allandale Branxton County: Northumberland
(Only for sites without specific street addresses)

Zone: 56 Topographic Map Sheet: GRETA 9232-1-S

Australian Map Grid References. TWO CONCENTRATIONS:-

DATA RECORDED ON AERIALS WITH THIS SITE COORDINATES ONLY

Eastings

Northings

Land status: Rural - Farming (currently) c/o

Full name of property owner: Greta Estates Prop. Ltd.

Postal address: 12 Woodside Avenue
Burwood
NSW 2134

Confirmed M. Cotten 6-11-2006

Application for a Section 90 Consent or Section 87(1) Permit – Version 12/02 Page 8

I-GVE-2

This surface artefact scatter is located on the hillslope (LFU 2), immediately to the south of the lower order stream on which I-GVE-1 is situated. Artefacts are visible within a vehicle access track between the northern limit of the study area and the northernmost upper order stream of the study area. This track is positioned along the eastern limit of the study area and runs parallel to the Main Northern Railway Line. Anvil Creek is located close by only 200 metres to the east, on the other side of the railway line. The access track and immediate surrounds (within 3 metres of the track) form an area of good visibility (approximately 70%). Beyond the track, moderate and dense grasses limit ground surface visibility to approximately 5 per cent. The boundary for this site has been defined as the area of high visibility (the access track itself).

A total of 10 artefacts were recorded at this site, all contained within the limits of the access track. This scatter extends from the northern limit of the track within the study area to the northernmost upper order stream of the study area, approximately 500 metres in length. It therefore extends from [illegible] Artefacts with double patination and water rolled surfaces associated with waterworn non-artefactual material suggests all material is imported fill for railway track construction. Only a small number of artefacts were recorded following recognition of these features. Further recording of specific attributes will be required to assess whether these artefacts have been imported. It is possible that both *in situ* and fill materials are intermixed. **Plate 4** is a view southeast along the track inside the boundary fence.

Table 18: Site contextual information for I-GVE-2

Category	Information Required	Information
Site Identification	Site number	I-GVE-2
	Site type	Stone artefact scatter
Site Location	AMG coordinates	
	Archaeological Survey Unit	1
Site Environment	Landform unit	2
	Geomorphological context	Hillslope
Site Description	Dimensions:	5 x 500 metres
	Site Boundary Criteria	Exposure parallel to fence line
	Site Contents	10 Flaked stone artefacts recorded. Only partial recording due to artefacts features suggesting material not in *situ*.
Land Surface Conditions	Exposure type and %,	Sheet erosion 15% Railway track 60%
	Visibility type and %	Sheet erosion 50% Railway track 70%
	Site formation, taphonomy	Water worn and impact damaged artefacts associated with waterworn non-artefactual material suggests all material is imported fill for railway track construction
Site Preservation / Condition	State of preservation	Artefacts with double patination and water rolled surfaces
Tabulation	Archaeological data	See Table below

SITE NAME: ALLANDALE RAIL 1

Site Type:	*Artefact scatter*	MGA Grid Reference:	
Date Recorded:	*22/09/2009*	Topographic Map:	*Greta 9132-1S*
Recorder:	*Georgia Stannard*		
Landform Element:	*Simple slope*	Vegetation:	*Cleared/grass/crop*
Slope:	*Gentle*	Ground Disturbance:	*Moderate*
Distance to Water:	*<50 metres*		

Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Arch. Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts per m^2 of Effective Locus Area	Sub-Surface Deposit
varies	varies	100	0.3	30	5	5	1.5	4	2.667	possible

Summary of Artefact Types and Stone Materials:

	Lithic Item Type			
Stone Material	flake - distal	flake - proximal	lithic fragment	**Total**
tuff	1	1	2	**4**
Total	**1**	**1**	**2**	**4**

Additional Comments:

- Artefacts on a horse track near the rail corridor fenceline;
- Low grass and herbs present;
- Within 50m of rail line.

Site Location: Allandale Rail 1

Photograph: Allandale Rail 1

SITE NAME: ALLANDALE RAIL 2

Site Type:	*Artefact scatter*	MGA Grid Reference:	
Date Recorded:	*28/09/2009*	Topographic Map:	*Greta 9132-1S*
Recorder:	*Georgia Stannard*		
Landform Element:	*Simple slope*	Vegetation:	*Cleared/grass/crop, Regrowth forest*
Slope:	*Gentle*		
Distance to Water:	*<50*	Ground Disturbance:	*Moderate*

Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Arch. Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts per m^2 of Effective Locus Area	Sub-Surface Deposit
100	6	1	1	1	20	10	0.1	2	20.000	possible

Summary of Artefact Types and Stone Materials:

	Lithic Item Type	
Stone Material	flake	**Total**
silcrete	2	**2**
Total	**2**	**2**

Additional Comments:

- Located within 5m of light vehicle access track and 15m north-west of eucalypt stand;
- Dense ground cover.

Site Location: Allandale Rail 2

Photograph: Allandale Rail 2

SITE NAME: ALLANDALE RAIL 3

Site Type:	*Artefact scatter*	MGA Grid Reference:	
Date Recorded:	*22/09/2009*	Topographic Map:	*Greta 9132-1S*
Recorder:	*Georgia Stannard*		
Landform Element:	*Simple slope*	Vegetation:	*Regrowth forest*
Slope:	*Level - very gentle*	Ground Disturbance:	*Low*
Distance to Water:	*<50*		

Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Arch. Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts per m^2 of Effective Locus Area	Sub-Surface Deposit
100	5	1	1	1	80	75	0.8	2	2.667	possible

Summary of Artefact Types and Stone Materials:

	Lithic Item Type		
Stone Material	flake	flake - distal	**Total**
silcrete	1		**1**
tuff		1	**1**
Total	**1**	**1**	**2**

Additional Comments:

- Artefacts located on an old vehicle track that is now being utilised as a horse track;
- Casuarina and grass present.

Site Location: Allandale Rail 3

Photograph: Allandale Rail 3 (artefact - inset)

SITE NAME: ALLANDALE RAIL 4

Site Type:	*Artefact scatter*	MGA Grid Reference:	
Date Recorded:	*22/09/2009*	Topographic Map:	*Greta 9132-1S*
Recorder:	*Georgia Stannard*		
Landform Element:	*Simple slope*	Vegetation:	*Cleared/grass/crop, Regrowth forest*
Slope:	*Gentle*		
Distance to Water:	*<50*	Ground Disturbance:	*Moderate*

Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Arch. Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts per m^2 of Effective Locus Area	Sub-Surface Deposit
100	3	6	0.5	3	80	50	1.5	3	2.000	possible

Additional Comments:

- Located on a light vehicle access track;
- Dense grass cover in the surrounding area;
- Artefacts comprise three silcrete flakes.

Site Location: Allandale Rail 4

Photograph: Allandale Rail 4

SITE NAME: ALLANDALE RAIL 5

Site Type:	*Artefact scatter*	MGA Grid Reference:	
Date Recorded:	*22/09/2009*	Topographic Map:	*Greta 9132-1S*
Recorder:	*Georgia Stannard*		
Landform Element:	*Simple slope*	Vegetation:	*Regrowth forest*
Slope:	*Level - very gentle*	Ground Disturbance:	*Low - moderate*
Distance to Water:	*<50*		

Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Arch. Visibility of Locus (%)	Effective Locus Area (m^2)	# of Artefacts	# of Artefacts per m^2 of Effective Locus Area	Sub-Surface Deposit
varies	varies	20	2	40	70	55	22	4	0.182	possible

Summary of Artefact Types and Stone Materials:

	Lithic Item Type		
Stone Material	flake	flake - medial	**Total**
silcrete	2		**2**
tuff	1	1	**2**
Total	**3**	**1**	**4**

Additional Comments:

- Located on a horse track;
- Estimated deposit depth of 0.5m with a low-moderate research potential;
- Casuarina and grass in locality.

Site Location: Allandale Rail 5

Photograph: Allandale Rail 5 (artefact - inset)