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UPGRADING THE PACIFIC HIGHWAY

Woolgoolga to Ballina Planning Alliance

UPGRADING THE PACIFIC HIGHWAY

Woolgoolga to Ballina Upgrade

Working Paper

Aboriginal Cultural Heritage Assessment

Wells Crossing to Iluka Road Section

November 2012

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NSW GOVERNMENT Transport Roads & Maritime Services

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Preface

The purpose and scope of this working paper is to describe and assess Aboriginal cultural heritage impacts that would occur as a result of the upgrade of the Pacific Highway between Woolgoolga and Ballina (the project).

This working paper comprises four parts based on geography (from south to north):

- Woolgoolga to Wells Crossing
- Wells Crossing to Iluka Road
- Iluka Road to Woodburn
- Woodburn to Ballina.

The four parts reflect the previous development projects that now make up the project (Figure 1). These divisions have been retained for this Aboriginal heritage assessment primarily to maintain continuity in the Aboriginal community consultation and participation process from the previous development projects.

Each of the four parts is made up of two volumes:

- Volume 1 – Aboriginal cultural heritage assessment report (CHAR)
- Volume 2 – Appendices.
  - Appendix A: Archaeological assessment for the relevant section.
  - Appendix B: Glossary of terms used in the Cultural Heritage Assessment Reports.
  - Appendix C: The Director-General's environmental assessment requirements.
  - Appendix D and E: Records of past and previous consultation.
  - Appendix F: The matrix of the ancillary works area assessment.
  - Appendix G: Predictive model maps produced by the Office of Environment and Heritage.
  - Appendix H: Maps showing the location of survey coverage and areas highlighted for survey priority in the Office of Environment and Heritage's predictive modelling.
  - Appendix I: Details the coverage of survey undertaken.
  - Appendix J: Tabulated sub-surface test-excavation results.
  - Appendix K: Summary of all sub-surface testing undertaken.
  - Appendix L: Stratigraphic drawings of soil profiles encountered during sub-surface testing.
  - Appendix M: Photos of the sites investigated.
  - Appendix N: Analysis of artefact / material discovered during investigations.
  - Appendix O: Results of radiocarbon dating (Woodburn to Ballina only).
  - Appendix P: Results of the ground-penetrating radar investigation (Woodburn to Ballina only).

Together the volumes for these four parts make up the working paper on Aboriginal cultural heritage for the entire project.

Each cultural heritage assessment report (Volume 1) has the following structure:

- Introduction (Chapter 1) - provides a broad overview of the project and a general description of the study area. It also identifies the purpose and structure of this report.
- Legislative context (Chapter 2) - outlines the statutory requirements and context of the project with regard to the Aboriginal heritage investigations.
- Consultation (Chapter 3) - describes the consultation process undertaken and summarises the outcomes.
- Existing environment (Chapter 4) – outlines the desktop assessment undertaken to determine the existing heritage conditions prior to undertaking investigations within the Alliance, including geology, geomorphology, vegetation, natural resources and recorded Aboriginal archaeological sites.
- Aboriginal cultural assessment (Chapter 5) – provides the Aboriginal cultural assessment undertaken to identify Aboriginal cultural values within the region of the project, with a particular focus on the intangible and historic Aboriginal cultural places that are not necessarily identified during the archaeological assessment, which focuses on material and pre-contact archaeological sites.
- Summary of archaeological assessment (Chapter 6) – provides a summary of the archaeological field investigations undertaken for the project, including field survey and sample sub-surface test-excavation, and the archaeological sites identified through this process. The full archaeological assessment is presented in Volume 2, Appendix A.
- Significance assessment (Chapter 7) – describes the process and results of assessing the significance of all identified Aboriginal cultural heritage values identified within or adjacent to the project.
- Impact assessment (Chapter 8) – describes the process and results of assessing how the project will avoid or impact on Aboriginal heritage values.
- Management recommendations (Chapter 9) – describes the general and specific management recommendations proposed for the project to protect, minimise and mitigate impact to Aboriginal heritage values. Management recommendations are appropriate to the assessed significance of the sites and places and the proposed impact from the project, and were developed with input from registered Aboriginal stakeholders.
- References (Chapter 10) – all references for each cultural heritage assessment report and archaeological assessment are presented in this chapter.

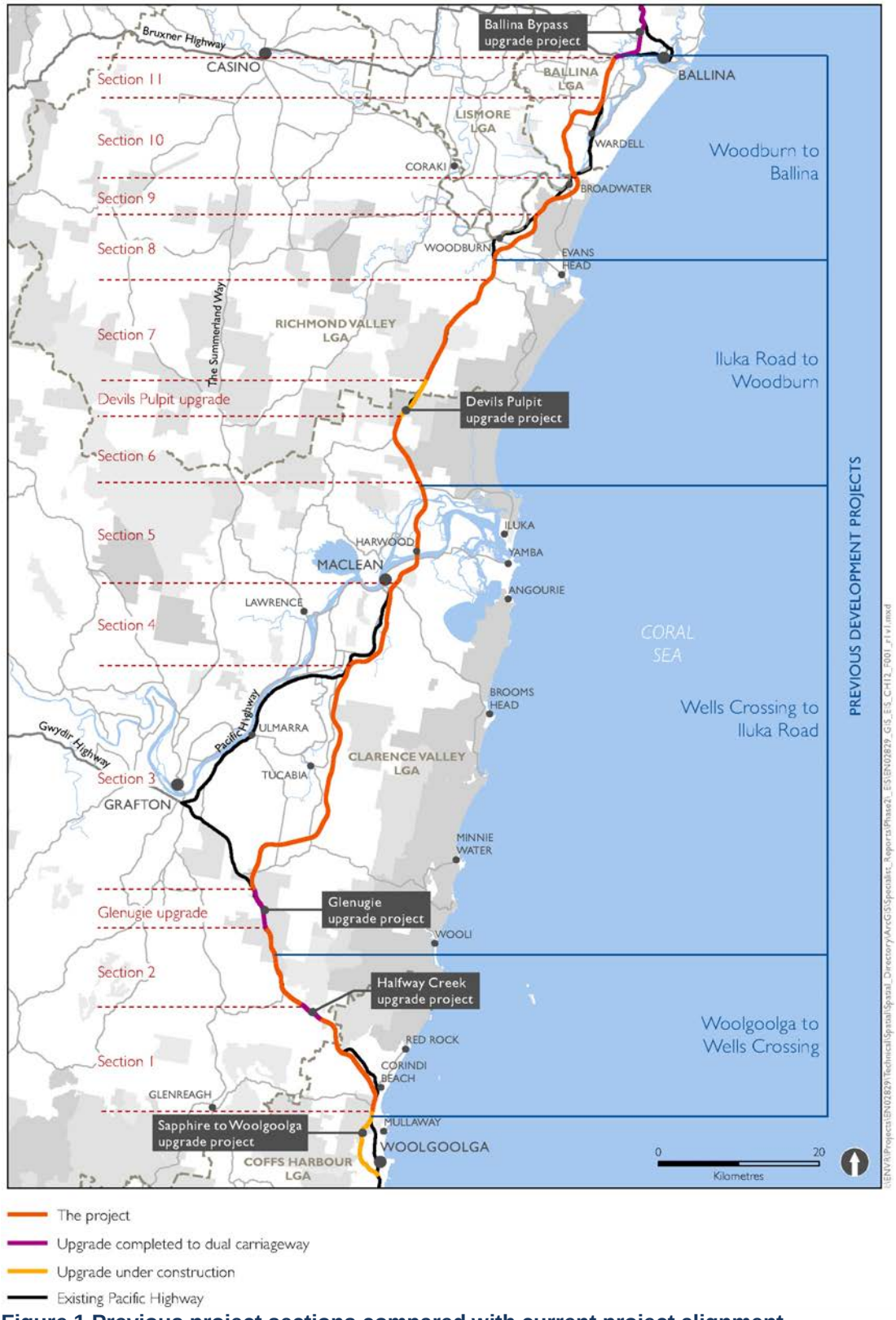

Figure 1 Previous project sections compared with current project alignment

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Executive summary

This report is the Aboriginal cultural heritage assessment report (CHAR) for the Woolgoolga to Ballina Pacific Highway Upgrade Project (the project), from Wells Crossing to Iluka Road. The purpose of this CHAR is to describe and assess potential Aboriginal cultural heritage impacts created by the proposed upgrade of the Pacific Highway between Wells Crossing and Iluka Road. This report has been prepared to inform the Environmental Impact Statement (EIS) and is generally consistent with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Environment and Conservation [DEC] 2005).

This CHAR considers work undertaken during both the route option phase and the detailed assessment phase, and includes discussions on all aspects relating to consultation, environmental background, the archaeology and cultural heritage values present, significance and impact assessments, and management recommendations. The archaeological assessment component of this report is included as Appendix A in Volume 2, while a summary of this assessment is included in this report.

The Woolgoolga to Ballina upgrade of the Pacific Highway is described in 11 sections. This CHAR reports on sections 3, 4 and 5 between Wells Crossing and Iluka Road.

Consultation

Aboriginal stakeholders have been involved throughout the project corridor between Wells Crossing and Iluka Road to date and consultation has been undertaken in accordance with the Roads and Maritimes Services' (RMS) Procedure for Aboriginal Cultural Heritage Consultation and Investigation 2011 (PACHCI), and the Office of Environment and Heritage's (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, (as well as the now redundant Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation [DEC 2005], and Interim Community Consultation Requirements for Applicants [Department of Environment and Climate Change 2005]). This included Aboriginal community involvement at Aboriginal focus group meetings during the route development and concept design phases; reviewing and commenting on draft reports, and undertaking fieldwork activities.

Assessment findings

The full archaeological assessment for Wells Crossing to Iluka Road can be found in Volume 2 which accompanies this document. A total of 10,007,415 square metres (94 per cent) of the project corridor of the Wells Crossing and Iluka Road sections was subject to field survey. The remaining area was assessed as not requiring survey.

Following the survey, 12 potential archaeological deposits (PADs) and three sites with PAD components were identified to be near or within the project corridor between Wells Crossing and Iluka Road. Sub-surface testing was undertaken at PADs (both the stand-alone PADs and those associated with sites). During the sub-surface testing of PADs, all were test-excavated, nine of which contained sub-surface Aboriginal deposits. As a result of the sub-surface testing, the status of the PADs was either confirmed as being sites, or where no archaeological material was found (and the PAD was not associated with a site), they were reassessed as not having archaeological potential.

At the completion of the assessment, four Aboriginal cultural places were identified within the project corridor between Wells Crossing and Iluka Road – two of will be impacted by the project;

both are of moderate Aboriginal cultural significance and both are landscape scale corridors of movement.

A total of nine archaeological sites (five artefact scatters and four isolated artefact sites) are within the project corridor, and eight are likely to be impacted by the project between Wells Crossing and Iluka Road. . No indirect impacts are likely to occur to known sites outside the project corridor.

Management recommendations

A number of management recommendations were developed for Aboriginal cultural places and archaeological sites within the project corridor between Wells Crossing and Iluka Road. A summary of the recommendations for archaeological sites is included below, while Section 9 includes full recommendations for both archaeological sites and Aboriginal cultural places.

Table 1-1 Summary of recommendations for archaeological sites

Project sections	Management recommendations	Number of sites	Name of site
4	Collection and salvage excavations (mechanical). Detailed analysis and reporting of cultural material. Dating of cultural material where applicable.	1	Tyndale 2 Site
3,4	Collection of artefacts. Detailed analysis and reporting of cultural material. No salvage excavation required.	7	WX2I Site 7 WX2I Site 6 WX2I Site 5 WX2I Site 4 Shark Creek Site 2 Hirst 1 Hirst 2
4	An exclusion zone should be put in place to ensure incidental damage does not occur to these archaeological deposits.	1	Tyndale 1

Abbreviations

ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
AFG/s	Aboriginal focus group/s
AHIMS	Aboriginal heritage information management system
AHIP	Aboriginal heritage impact permits
ASIRF	Aboriginal site impact recording form
CHAR	Cultural heritage assessment report
DEC	NSW Department of Environment and Conservation (now the Office of Environment and Heritage)
DECC	NSW Department of Environment and Climate Change (now the Office of Environment and Heritage)
DECCW	NSW Department of Environment, Climate Change and Water (Now the Office of Environment and Heritage)
DP&I	NSW Department of Planning & Infrastructure
EIS	Environmental impact statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
g	Gram/s
GIS	Geographic information system
GPS	Global positioning system
H	High
ha	Hectare/s
ICOMOS	International Council on Monuments and Sites
km	Kilometre/s
L	Low
LALC	Local Aboriginal land council
LEP	Local environmental plans
LGA	Local government areas

m	Metre/s
M	Moderate
mm	Millimetre/s
MPC	Multiplatform core
N/A	Not applicable
NPWS	NSW National Parks and Wildlife Service (part of the OEH)
NSW	New South Wales
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal cultural heritage consultation and investigation
PAD	Potential archaeological deposit
RTA	Roads and Traffic Authority of NSW
RMS	NSW Roads and Maritime Services
SKM	Sinclair Knight Merz Pty Ltd
SPC	Single platform core
STP	Shovel test pits
TBA	To be announced
TBC	To be confirmed
UNESCO	United Nations educational, scientific and cultural organisation

1. Introduction

1.1. Overview

The RMS is seeking approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979* to upgrade around 155 kilometres of the Pacific Highway from Woolgoolga to Ballina.

The purpose of this CHAR is to describe and assess Aboriginal cultural heritage impacts that would occur as a result of the proposed upgrade of the Pacific Highway between the Wells Crossing and Iluka Road sections of the project. This CHAR has been prepared to inform the EIS, which accompanies the project approval application.

This CHAR covers the project from Wells Crossing to Iluka Road; three other CHARs have been prepared that cover sections from Woolgoolga to Wells Crossing, Iluka Road to Woodburn, and Woodburn to Ballina, respectively.

1.2. Study objectives and scope

1.2.1. Objectives

The purpose of this study is to undertake a detailed assessment of Aboriginal heritage within the project corridor between Wells Crossing and Iluka Road to determine the level of impacts from the project.

The objectives of this Aboriginal cultural heritage assessment report are to:

- Undertake an Aboriginal cultural heritage assessment, including an archaeological assessment, in accordance with relevant guidelines.
- Prepare a technical paper which addresses the Department of Planning and Infrastructure (DP&I) Director-General requirements.
- Summarise and present the cultural heritage assessment to ensure that potential impacts have been assessed and issues finalised, to allow an informed decision to be made by all stakeholders.

The Aboriginal heritage assessment is presented in two volumes:

- Volume 1: Cultural heritage assessment report.
- Volume 2: Archaeological assessment (Appendix A), and supporting information (Appendices B-T).

1.2.2. Scope of assessment

Broadly, the scope of the Aboriginal cultural heritage assessment was as follows:

- Meet the DP&I Director-General's environmental assessment requirements.
- Identify gaps in previous Aboriginal heritage assessments (Navin Officer 2009) and address these through further desktop assessment.
- Undertake comprehensive Aboriginal stakeholder consultation (both through meetings and field investigations).
- Undertake field investigations (survey and test excavation) with registered Aboriginal party site officers to investigate known sites and identify and test PADs to better define the Aboriginal cultural heritage values within the project corridor.
- Undertake a significance assessment of the sites and places identified. This includes both scientific (archaeological) and cultural (determined by Aboriginal stakeholders).
- Provide an assessment of the potential impact/harm to Aboriginal cultural heritage sites and places.
- Develop management recommendations in consultation with registered Aboriginal parties in order to ensure that prior to, during and after construction Aboriginal cultural heritage sites and places are effectively managed. The level of management required would be based on the identified impacts and the significance of the site or place.
- Provide a completed CHAR for the project.

1.2.3. Study requirements

The investigations and assessments were undertaken with regard to the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (NSW) 2010, Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 and the now obsolete Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005).

This assessment has been undertaken in compliance with RMS' PACHCI.

Additionally, this assessment was based upon the Department of Planning and Infrastructure Director-General's environmental assessment requirements, issued on the 23 November 2011 for the project relating to Aboriginal heritage.

Table 1-1 details the DP&I Director General's environmental assessment requirements relating to Aboriginal heritage and where these are addressed within this report. These requirements require assessment of the impacts to sites and places 'within or near' the project corridor. However, it should be noted that areas near but outside the project corridor have not been able to be comprehensively investigated or surveyed, and no sub-surface investigation was undertaken, as this is beyond the scope and authority of this assessment.

Table 1-1 Director-General's environmental assessment requirements for key issue Aboriginal heritage

Requirements	Where addressed in report?
Investigation of impacts to Aboriginal heritage (including cultural and archaeological significance), in particular impacts to Aboriginal heritage sites identified within or near the project should be assessed.	Chapter 5, 6, 7 and 8
Where impacts are identified, the assessment shall: ▪ Outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of these measures), generally consistent with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Environment and Conservation 2005).[1]	Chapter 3 and 9
▪ The assessment shall be undertaken by a suitably qualified heritage consultant.	Chapter 6 Chapter 2
▪ The assessment shall demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures).	Chapters 3 and 9 Volume 2
▪ The assessment shall develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations of the areas of PAD identified in a manner that establishes the full spatial extent and significance of any archaeological evidence across each area of PAD, and include the results of these excavations.	Chapter 6 Volume 2

This Aboriginal cultural heritage assessment report was undertaken by fully qualified and experienced archaeologists and heritage consultants, primarily Joseph Brooke (Bachelor of Archaeology (Honours), 6 years experience), Robyn Jenkins (Bachelor of Arts, Bachelor of Social Science (Honours), and 5 years experience), and Vanessa Edmonds (Bachelor of Arts, Master of Letters, 25 years experience).

[1] These guidelines have been superseded by Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH). Both the 2010 requirements and the 2005 guidelines are followed in this CHAR.

1.2.4. Definitions

In this report, the term 'site' and 'place' are used to refer to Aboriginal archaeological sites (the same as *objects* in the *National Parks and Wildlife Act 1974*), and intangible or non-archaeological Aboriginal cultural places (not necessarily declared *Aboriginal places* as per *National Parks and Wildlife Act 1974*), respectively.

The term 'project' is used to refer to, and includes, the construction and operational footprints of the Woolgoolga to Ballina upgrade of the Pacific Highway, that is, approximately 155 kilometres of proposed upgraded highway.

The capitalised term 'Section' has been used to refer to a section in this report (eg Section 2.1.2), whereas the non-capitalised term 'section' has been used to generally describe the particular section or sections of the project from Wells Crossing to Iluka Road (eg section 4 – refer to Table 1-2 below).

1.2.5. Study area

The area subject to this assessment includes the section of the project corridor between Wells Crossing and Iluka Road. The project within the context of the region is shown in Figure 1-1. The project boundary in the three project sections covered in this report between Wells Crossing and Iluka Road are shown in Figure 1-2, Figure 1-3 and Figure 1-4.

The project corridor is generally 100 metres wide with interchanges and areas of large cutting and earth embankments typically being wider. The operational footprint of the project includes ancillary elements, such as local access roads and permanent water quality basins, all of which are located within the project design boundary – referred to as the project corridor. The study area encompasses the project corridor and any peripheral land areas where indirect impacts may occur. Finally, the study region is discussed in terms of the general landscape in which the project corridor is located, which in the broader context is the NSW North Coast region.

The future delivery of the project would be staged in sections based on upgrade need and availability of funding. For the purposes of planning this future staging, the project has been divided into 11 indicative sections as listed in Table 1-2; sections covered in this report are shown in Figure 1-2, Figure 1-3 and Figure 1-4.

For the purposes of this report, only the project corridor between Wells Crossing and Iluka Road is examined, specifically project section 3, section 4,and section 5 (Table 1-2).

Table 1-2 Summary of project sections in relation to the CHAR assessments (bold type indicates Wells Crossing to Iluka Road project section assessed in this report)

Project section	Location	Relevant Aboriginal focus group
1	Woolgoolga to Halfway Creek	Woolgoolga to Wells Crossing
2	Halfway Creek to Glenugie upgrade	Woolgoolga to Wells Crossing
3	**Glenugie upgrade to Tyndale**	**Wells Crossing to Iluka Road**
4	**Tyndale to Maclean**	**Wells Crossing to Iluka Road**

Project section	Location	Relevant Aboriginal focus group
5	**Maclean to Iluka Road, Mororo**	**Wells Crossing to Iluka Road**
6	Iluka Road to Devil's Pulpit upgrade	Iluka Road to Woodburn
7	Devil's Pulpit upgrade to Trustums Hill	Iluka Road to Woodburn
8	Trustums Hill to Broadwater National Park	Iluka Road to Woodburn and Woodburn to Ballina
9	Broadwater National Park to Richmond River	Woodburn to Ballina
10	Richmond River to Coolgardie Road	Woodburn to Ballina
11	Coolgardie Road to Ballina bypass	Woodburn to Ballina

1.3. The project

1.3.1. Project description

The project corridor between Wells Crossing and Iluka Road would achieve four lanes of divided highway from about five kilometres north of Woolgoolga to about six kilometres south of Ballina. The general location of the project is shown in Figure 1-1 and an overview of the project is shown in Figure 1-2.

Key features of the project would include:

- A class M (motorway standard) highway, comprising a four-lane dual carriageway (two lanes in each direction) that can be upgraded to a six-lane dual carriageway in the future, if required.
- Ten grade-separated interchanges to provide access to and from the upgraded highway.
- Bridges for waterway crossings, including a major bridge for the crossing of the Clarence River.
- Overbridges and underpasses to maintain access along local roads crossed by the upgraded highway.
- Viaduct structures in places where the upgraded highway would traverse low-lying or flood-prone areas.
- Service roads and access roads to maintain connections to existing local roads and properties.
- Rest areas located at 50 kilometre intervals for both northbound and southbound traffic.
- Structures to facilitate fauna passage over and under the upgraded highway.

In addition to the construction footprint, ancillary areas are required adjacent to the project corridor for construction. The impact of these ancillary areas would vary due to the different levels of ground disturbances required for each of the works. Ancillary areas would include:

- Main and satellite compound areas.
- Stockpile areas.
- Plant and workshops.
- Vehicle parking.
- Bridge construction areas.
- RMS site office.
- Materials processing areas.

The approval sought is for a class M upgrade standard, however, staging of the project would result in some sections being initially constructed to a class A (arterial) upgrade standard.

The project does not include the upgrade at Glenugie, which is located between Wells Crossing and Iluka Road, as this project has already been approved.

1.3.2. Project route development

Planning for the project commenced in 2004 and has involved ongoing community consultation and environmental investigations. Route selection and concept design development was completed in four sections, which are referred to throughout this document as the 'previous development projects'. The four previous development projects were:

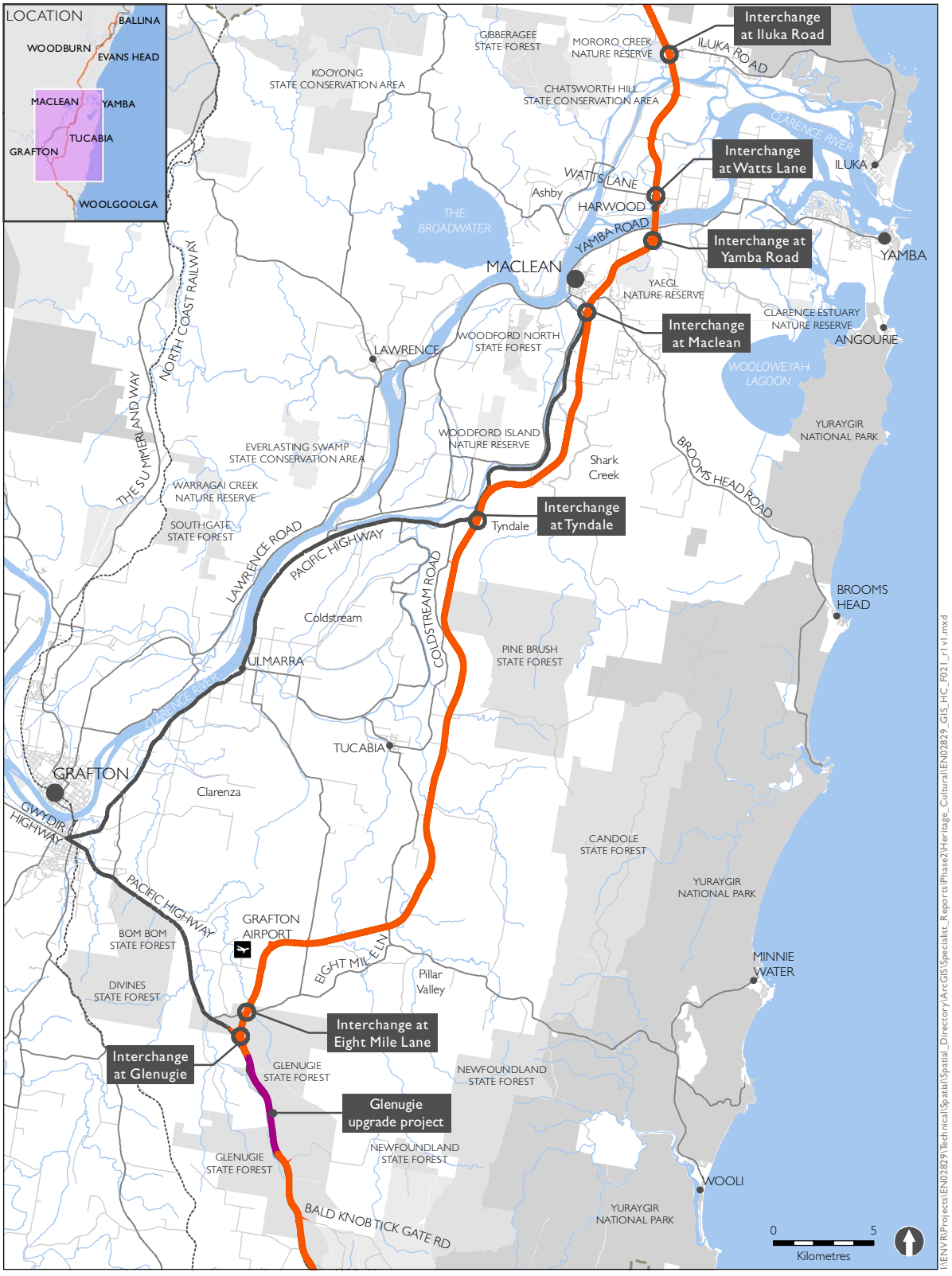
- Woolgoolga to Wells Crossing.
- **Wells Crossing to Iluka Road (this CHAR).**
- Iluka Road to Woodburn.
- Woodburn to Ballina.

The route development process for the previous development projects between Wells Crossing and Iluka Road typically involved the following steps:

- Assessing preliminary information on engineering, environmental, social and economic constraints.
- Identifying and developing potential route options.
- Short-listing and refining feasible route options for further investigation.
- Comparing short-listed options in terms of functional, environmental, social and economic criteria, with input from the community and stakeholders.
- Selecting the preferred route and developing the concept design for the preferred route.

Additional documentation supporting the development of the preferred route and concept design for the project, including methodology, working papers and outcomes of community and stakeholder involvement, is available on the RMS website www.pacifichighwayupgrade.com.au (click on Woolgoolga to Ballina).

Figure 1-1 The project Alignment - Wells Crossing to Iluka Road



1.3.3. Previous Aboriginal heritage assessment

Preliminary Aboriginal heritage assessment has previously been undertaken for this project between Wells Crossing and Iluka Road during an earlier phase of the concept design (Navin Officer 2009). Navin Officer's (2009) assessment commenced in 2006 and considered a corridor very similar to the current project corridor. Navin Officer (2009) aimed to identify all Aboriginal heritage constraints for the corridor, so that these could be considered in the concept design. Navin Officer (2009) undertook:

- Consultation with relevant Aboriginal stakeholders via an Aboriginal focus group (AFG) for the project corridor between Wells Crossing and Iluka Road of the project to identify known Aboriginal cultural places within the project corridor at the time. Navin Officer's (2009) consultation was in accordance with the Interim Community Consultation Requirements for Applicants (2005) (Department of Environment and Conservation 2005) and the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (Department of Conservation 2005).
- Field survey across 90 per cent of the project corridor at the time, almost all of which is within the current project corridor.

1.3.4. Project sections

The Woolgoolga to Ballina project is described in 11 sections as identified in Table 1-3 and depicted in Figure 1-2. Each of these sections has a start and end point which ties in to the existing highway, therefore assisting identification of project stages. Project stages may comprise one (or more than one) of those sections identified in Table 1-3. The sections relevant for this CHAR are sections 3, 4 and 5, as highlighted in the table.

Table 1-3 Project sections (bold type indicates Wells Crossing to Iluka Road project section assessed in this report)

Section	Location	Approximate chainage (m)		Length (km)	Initial upgrade standard
		Start	Finish		
1	Woolgoolga to Halfway Creek *1a: Woolgoolga to Range Road* *1b: Range Road to Halfway Creek*	 0 9650	 9650 17,000	 9.6 7.4	 Class M Class A
2	Halfway Creek to Glenugie upgrade	17,000	28,700	11.7	Class A
3	**Glenugie upgrade to Tyndale**	**33,800**	**68,800**	**35.0**	**Class M**
4	**Tyndale to Maclean**	**68,800**	**82,000**	**13.2**	**Class M**
5	**Maclean to Iluka Road, Mororo** ***5a: Maclean to Watts Lane*** **5b: *Watts Lane to Iluka Road***	**82,000**	**96,400**	**14.4**	 **Class M** **Class A**
6	Iluka Road to Devil's Pulpit upgrade	96,400	105,600	9.2	Class A
7	Devil's Pulpit upgrade to Trustums Hill	111,100	126,400	15.3	Class A

Section	Location	Approximate chainage (m)		Length (km)	Initial upgrade standard
8	Trustums Hill to Broadwater National Park	126,400	137,600	11.2	Class M
9	Broadwater National Park to Richmond River	137,600	145,100	7.5	Class M
10	Richmond River to Coolgardie Road	145,100	158,600	13.5	Class M
11	Coolgardie Road to Ballina bypass	158,600	164,000	5.4	Class M

Figure 1-2 Section 3 - Glenugie upgrade to Tyndale

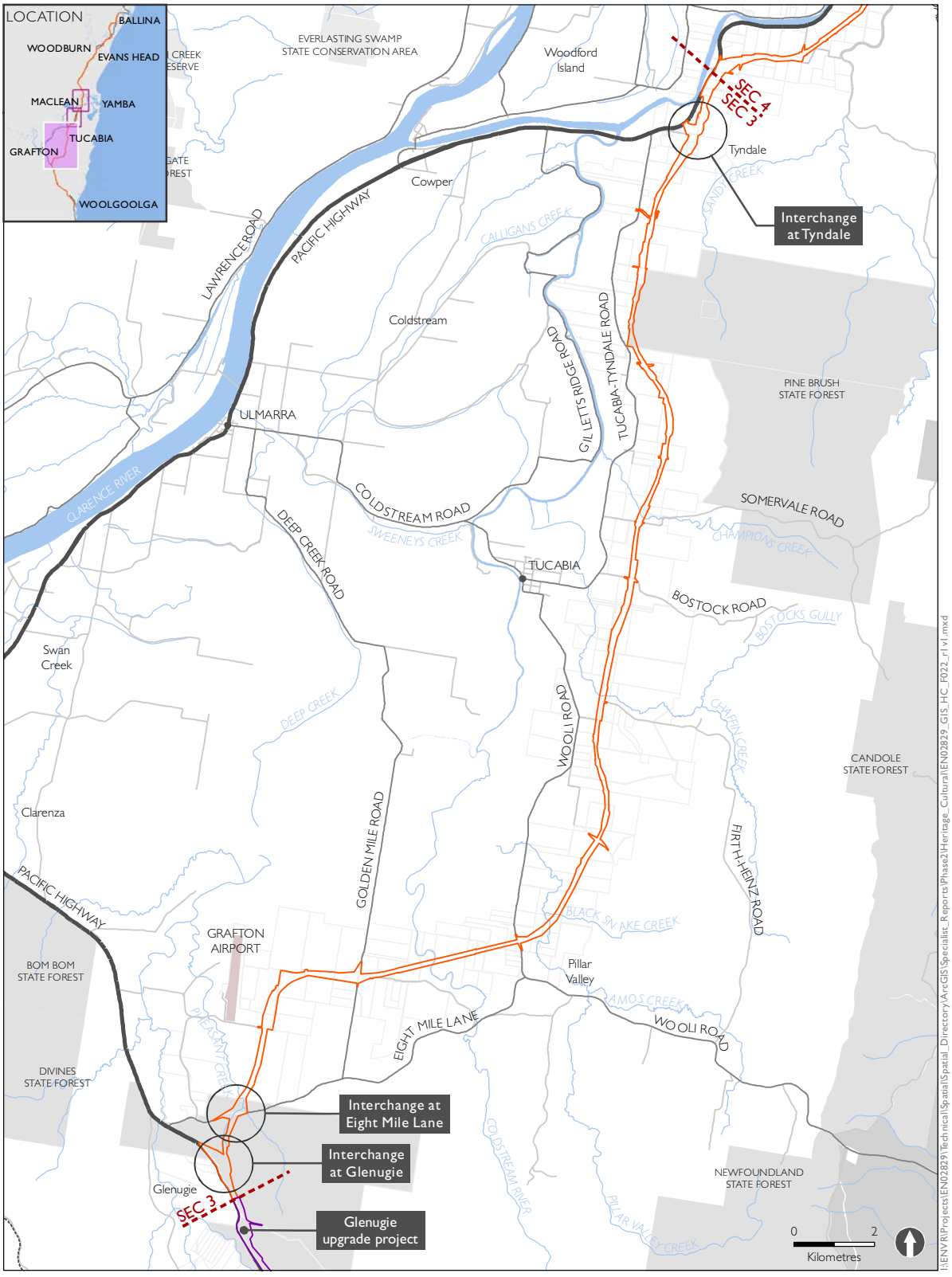
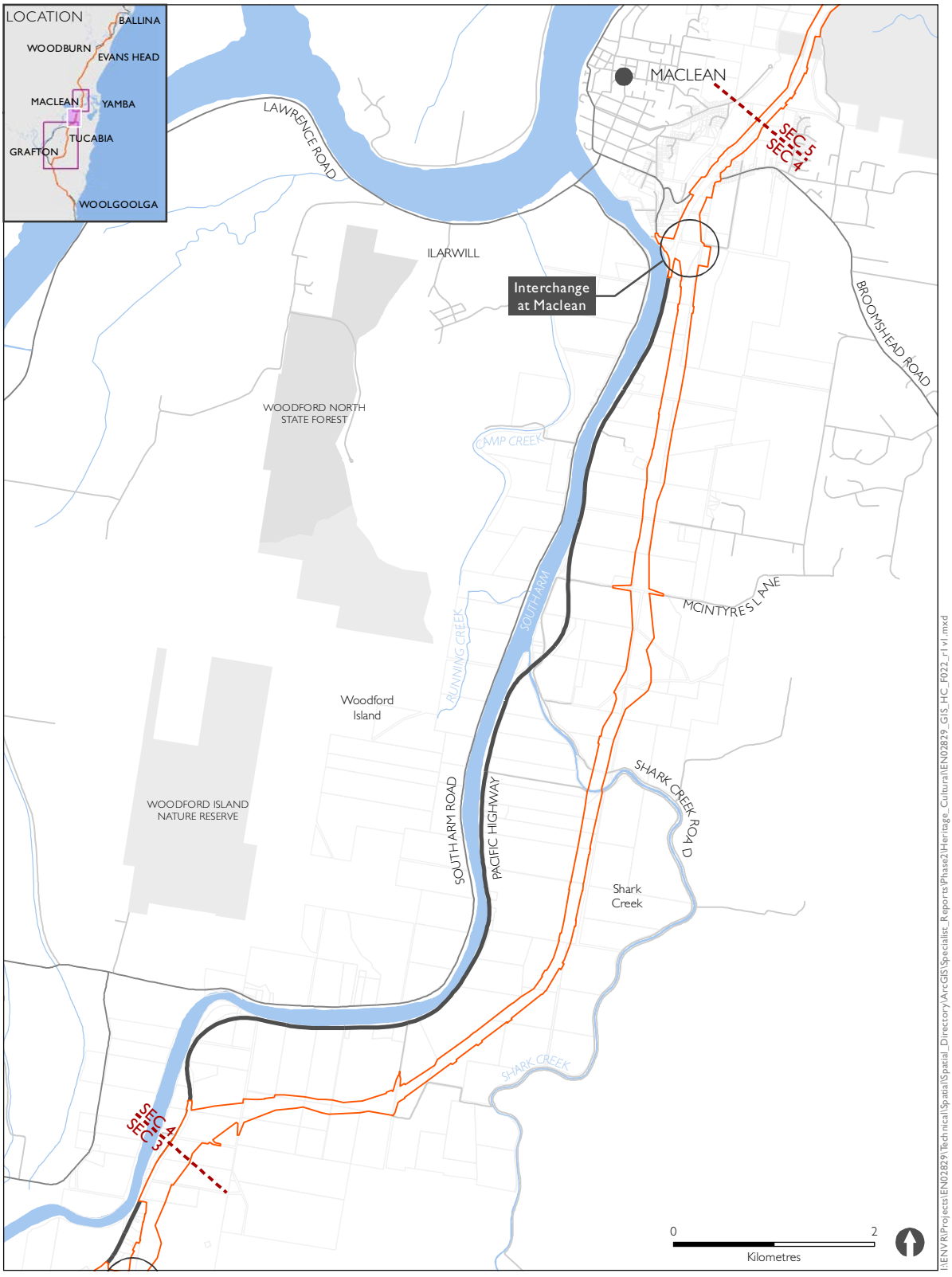


Figure 1-3 Section 4 - Tyndale to Maclean

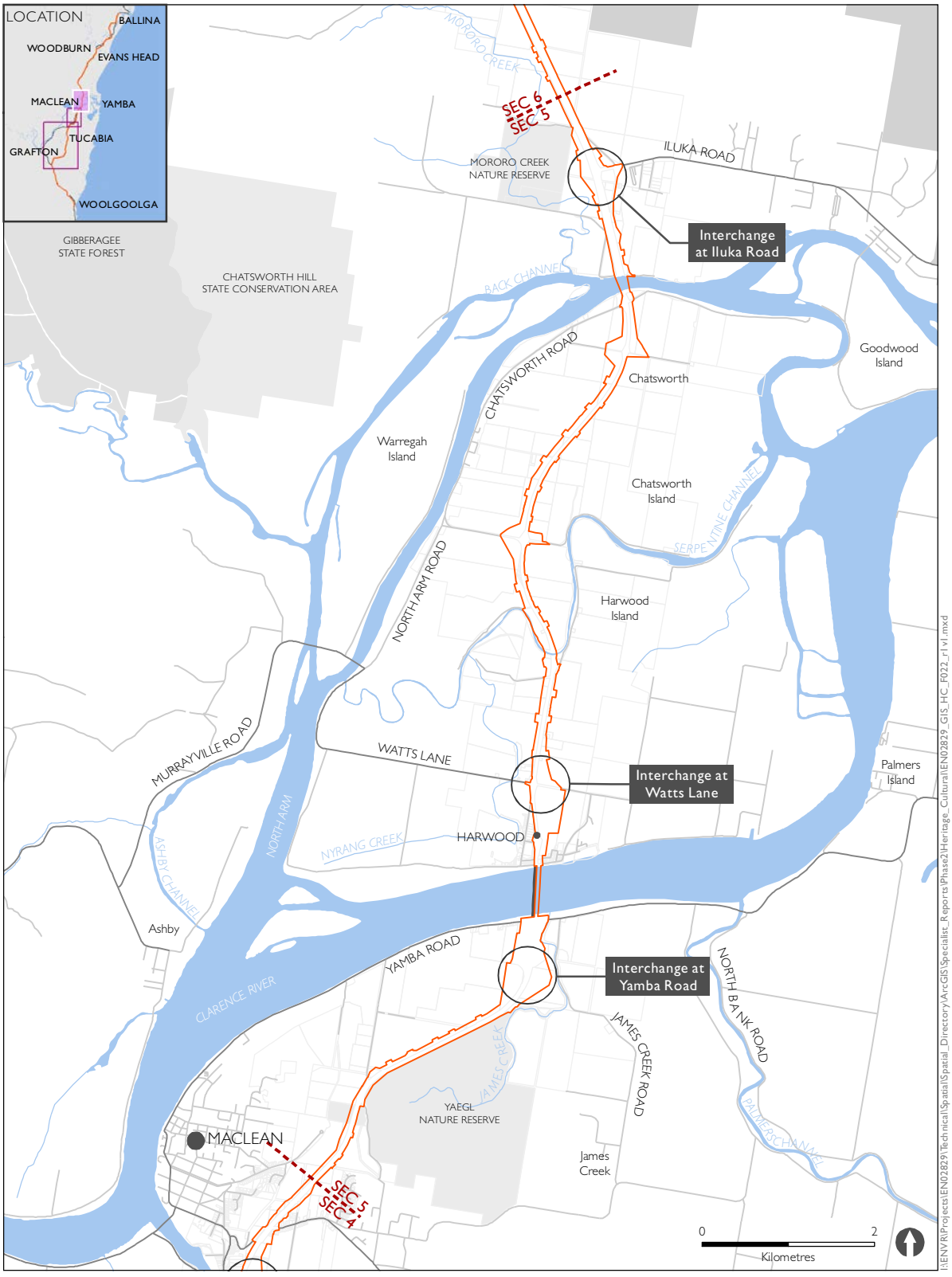


The project

Upgrade completed to dual carriageway

Existing Pacific Highway

Figure 1-4 Section 5 - Maclean to Iluka Road



The project

Upgrade completed to dual carriageway

Existing Pacific Highway

2. Legislative context

The following legislation is relevant to this investigation:

New South Wales

- *Environmental Planning and Assessment Act 1979.*
- *National Parks and Wildlife Act 1974.*
- *National Parks and Wildlife Amendment Act 2010.*
- *Native Title Act (NSW) 1994.*

Commonwealth

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*
- *Environmental Protection and Biodiversity Conservation Act 1999.*
- *Native Title Act 1993.*

Additionally, the United Nations' *Declaration on the Rights of Indigenous Peoples*, to which Australia is a signatory, also provides further legislative context.

These Acts and how their relevant sections and associated regulatory documents (eg codes of practice, guidelines, etc) govern the project are described in Table 2-1. It is important to note from Table 2-1 that this project has been assessed as 'state significant infrastructure' under Part 5.1 of the *Environmental Planning and Assessment Act 1979*. As such, an Aboriginal heritage impact permit (AHIP) under s.90 of the *National Parks and Wildlife Act 1974* would not be required to investigate Aboriginal objects within the project, provided that the investigation would address the DP&I Director-General's requirements (see Table 1-1).

Table 2-1 Legislative framework

Reference	Requirements
Environmental Planning and Assessment Act 1979	▪ Framework for environmental planning and assessment in New South Wales. Including the requirement for environmental impacts to be considered prior to development approval. ▪ Includes requirements for Aboriginal cultural heritage items and places. ▪ Local government areas (LGAs) prepare local environmental plans (LEPs) and development control plans in accordance with the Act to provide guidance on the level of environmental assessment required. ▪ Part 5.1 of the Act applies to state significant infrastructure. ▪ Under Part 5.1 section 115ZG, a range of approvals are not required, including Section 90 AHIP. Once environmental assessment requirements are issued by the Director-General of Planning and Infrastructure for a Part 5.1 project, any investigative or other activities complying with the requirements are also taken to be part of the project approval.

Reference	Requirements
National Parks and Wildlife Act 1974	■ Administered by the OEH. ■ Serves to protect Aboriginal objects and Aboriginal places in NSW. ■ Under the terms of the *National Parks and Wildlife Act 1974*, any person who harms an Aboriginal object is guilty of an offence. ■ An Aboriginal object (s5) is defined as: 'any deposit, object or material evidence (not being a handicraft for sale) relating to Aboriginal and non-European habitation of the area that comprises New South Wales, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.' ■ An Aboriginal place is an area that has been declared by the Minister as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects. ■ Aboriginal heritage information system (AHIMS) – Register for identified Aboriginal objects or places. ■ An AHIP is needed to undertake a number of activities, relevant to development are those issued under section 90 of the Act (though the project is exempt from applying for AHIPs under Part 5.1 section 115ZG of the *Environmental Planning and Assessment Act 1979)*. ■ AHIP applications must be submitted and approved by the OEH. ■ New procedures that accompany the *National Parks and Wildlife Amendment Act 2010* include, the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales 2010, the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, and the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW 2010.
Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales 2010	■ The *National Parks and Wildlife Act 1974* provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an AHIP. A due diligence code of practice has been developed to guide proponents on how to take due diligence and whether or not they should apply for an AHIP ■ Provisions relating to the due diligence system are effective from 1 October 2010.
Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP)	■ Establishes the requirements for consultation (under part 6 of the *National Parks and Wildlife Act 1974*) with Aboriginal stakeholders as part of the heritage assessment process to determine potential impacts of proposed activities on Aboriginal objects and places and to inform decision making for any application for an AHIP. ■ The ACHCRP comprises 4 stages with associated timeframes which must be adhered to: - **Stage 1** – Notification of project proposal and registration of interest (14 days from date letter sent to register as a registered Aboriginal party). - **Stage 2** – Presentation of information about the proposed project (set up Aboriginal focus group [AFG] meetings, prepare info, etc). - **Stage 3** – Gathering information about cultural significance (28 days for registered Aboriginal parties to provide a review and feedback to consultants' methodology). - **Stage 4** – Review of draft cultural heritage assessment report (registered Aboriginal parties have 28 days from sending of the report to make a submissions).

Reference	Requirements
Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010	■ The Code sets out the detailed requirements for archaeological investigations of Aboriginal objects in NSW for activities that require assessment under Part 4 or Part 5 of the *Environmental Planning and Assessment Act 1979.* An AHIP to undertake test excavation is not required if complying with this Code, as test excavations complying with this Code are excluded from the definition of harm to an Aboriginal object. ■ The Code sets out in detail: - Minimum qualifications for anyone undertaking archaeological investigation under the Code in NSW. - Assessment steps required to be undertaken for all archaeological investigation. - Assessment steps that may be required to be undertaken to adequately characterise the Aboriginal objects being investigated. The Code must be used for investigation that is likely to result in an AHIP application. However, once the DP&I Director-General's environmental assessment requirements are issued, the project is exempt from the requirement to obtain an AHIP and hence also this code.
Native Title Act (NSW) 1994	■ The *NSW Native Title Act 1994* was introduced to ensure that the laws of NSW are consistent with the Commonwealth Native Title Act 1994. It validates past and intermediate acts which may have been invalidated because of the existence of native title.
Aboriginal Land Rights Act (NSW) 1983	The *Aboriginal Land Rights Act* recognises the rights of Aboriginal people in New South Wales and provides a vehicle for the expression of self-determination and self-governance. The purposes of the Act are: ■ To provide land rights for Aboriginal persons in New South Wales, ■ To provide for representative LALCs in New South Wales, ■ To vest land in those LALCs, ■ To provide for the acquisition of land, and the management of land and other assets and investments, by or for those LALCs and the allocation of funds to and by those LALCs, ■ To provide for the provision of community benefit schemes by or on behalf of those LALCs.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	■ Protects Aboriginal cultural property in a wider sense and includes any places, objects and folklore that "are of particular significance to Aboriginals in accordance with Aboriginal tradition". ■ The Act may apply to contemporary Aboriginal cultural property as well as ancient sites. ■ The responsible Minister may make a declaration under Section 10 of the Act in situations where state or territory laws do not provide adequate protection of heritage places.
Environmental Protection and Biodiversity Conservation (EPBC) Act 1999	■ The EPBC Act includes provisions to protect matters of national environmental significance and Commonwealth land. Lists and registers made under the Act include: - A National Heritage List of places of national heritage significance. - A Commonwealth Heritage List of heritage places owned or managed by the Commonwealth. - Management of the Register of the National Estate. An independent expert body, the Australian Heritage Council, advises the Minister on the listing and protection of heritage places.

Reference	Requirements
Native Title Act 1993	■ Recognises and protects native title, and provides that native title cannot be extinguished contrary to the Act. ■ National Native Title Tribunal is a Commonwealth Government agency set up under this Act and mediates native title claims under the direction of the Federal Court of Australia. ■ The National Native Title Tribunal maintains the following registers: - National Native Title Register. - Register of Native Title Claim. - Unregistered claimant applications. - Register of Aboriginal land use agreements.
Declaration on the Rights of Indigenous Peoples	■ The Declaration makes statements regarding the rights of Indigenous peoples, and expectations of States' roles in this. This includes, in Article 11, that Indigenous peoples have the right to 'maintain, protect and develop past present and future manifestations of their cultures', including archaeological sites. The Declaration is a non-binding instrument, but there is some discussion that it may be a reflection of customary international law, which would bind States to the provisions.

3. Consultation

3.1. Consultation and assessment process

Aboriginal stakeholder engagement and involvement has been important for the identification of Aboriginal cultural values of the project. This chapter details the consultation process used for the project corridor between Wells Crossing and Iluka Road. This includes the identification of registered Aboriginal parties and the nature of Aboriginal stakeholder consultation and involvement in the assessment process.

3.1.1. Overview of consultation

The consultation undertaken to date has followed relevant government and RMS consultation guidelines. However, consultation for this project has been undertaken over a long period and consequently has occurred under several consultation frameworks.

The relevant frameworks are:

- Initial consultation began in 2004, with key stakeholders as part of the route options investigation to select a preferred route for Wells Crossing and Iluka Road (Navin Officer 2009).
- Following the introduction of the Interim Community Consultation Requirements for Applicants (DECC 2005), updates to the consultation process (namely advertising for interested stakeholders) were undertaken to generally comply with these requirements. This occurred part way through the options assessment (Collins 2005).
- In 2010, when the environmental impact assessment for the project commenced, the Roads and Traffic Authority (now RMS) proceeded to bring the consultation process up to date with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (Department of Environment, Climate Change and Water [DECCW 2010]), including re-advertising and notifying potential interested parties. These changes were addressed by a revision of the PACHCI in 2011.

In the intervening period from 2010, the PACHCI 2011 was revised and this required some further updates so that the consultation complied with PACHCI.

The Director-General of the Department of Planning and Infrastructure has issued environmental assessment requirements for the project (Table 1-1), which include assessment of impacts to Aboriginal heritage, and mitigation and management measures to be generally consistent with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005). These guidelines have now been superseded by the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRP) (DECCW 2010), which are followed in this assessment. As the 2010 and 2005 consultation requirements are broadly similar (with the 2010 requirements being generally more rigorous), this assessment remains consistent with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005), and consequently the Director-General requirements. The Director-General requirements

also require consultation with local Aboriginal land councils and Aboriginal stakeholders relevant to the project; the project also complies with this requirement.

It should be noted that there are no Native Title holders within the project corridor, as Native Title holders have specific rights in relation to cultural heritage. Several claimants exist for the project corridor and were consulted during this assessment; see below for more discussion on this.

Relevant guidelines and the consultation process are detailed below.

3.2. Consultation and assessment requirements

3.2.1. Roads and Maritime Services consultation procedure

Consultation with registered Aboriginal parties followed the process described in the RMS PACHCI (RMS 2011). This aimed to ensure that registered Aboriginal parties had the opportunity to contribute to the assessment through:

- The development and design of the archaeological and cultural assessment methodologies.
- The identification of key Aboriginal heritage constraints to be considered within the design.
- The development of recommendations for the management of archaeological sites within the project corridor.

Consultation for the project corridor between Wells Crossing and Iluka Road is being undertaken up to and including Stage 3 of the 2011 PACHCI procedure for projects assessed under Part 5.1 of the *Environmental Planning and Assessment Act 1979*. The stages of PACHCI are:

- Stage 1 – Internal RMS assessment to identify key environmental issues.
- Stage 2 – Further assessment and site survey, with an archaeologist and specific Aboriginal stakeholders to assess the project's potential cultural heritage impacts.
- Stage 3 – Where Stages 1 and 2 lead to the preliminary view that harm to Aboriginal objects or places is likely to occur, then formal consultation must be undertaken and a cultural heritage assessment report prepared. This may also include sub-surface testing where required.
- Stage 4 – Implement project mitigation measures (eg salvage) in accordance with project approval.

3.2.2. Consultation requirements for proponents

The ACHCRP replace the Interim Community Consultation Requirements for Applicants (DEC 2005) and Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation. These requirements apply to all AHIP applications submitted after 12 April 2010. This project does not require any AHIPs, as it is being assessed under Part 5.1 of the *Environmental Planning and Assessment Act 1979*; consequently, these requirements do not strictly need to be applied. The consultation and assessment process for this project was commenced prior to ACHCRP (DECCW 2010). Therefore, a number of updates were undertaken to ensure all relevant Aboriginal stakeholders were included in the consultation process and also to transition the consultation process from the obsolete requirements to the new and current requirements.

The ACHCRP includes a process for the notification and registration of interested stakeholders, preparation for the Aboriginal cultural heritage assessment and the drafting, review and finalisation of an Aboriginal cultural heritage assessment report.

3.3. Previous Aboriginal community consultation

3.3.1. Aboriginal focus groups 2005 - 2009

The project corridor between Wells Crossing and Iluka Road of the Pacific Highway Woolgoolga to Ballina upgrade project has been subject to numerous investigations at various stages, such as during route selection and previous development projects. During the route selection stages, Aboriginal stakeholders were consulted at AFGs with regard to potential Aboriginal cultural heritage issues.

The Wells Crossing to Iluka Road selection of the preferred route option commenced prior to 2005. In total, five AFG meetings were held between May 2005 and June 2009 as detailed in Table 3-1.

Table 3-1 AFG meetings held for Wells Crossing to Iluka Road route options investigations

Aboriginal focus group meetings	Dates
AFG1	23 May 2005
AFG2	24 February 2006
AFG3	6 September 2007
AFG4	22 September 2008
AFG5	2 June 2009

Site officers nominated to represent the AFG were invited to attend fieldwork activities and accompanied the archaeologists during the survey period. AFG stakeholders were provided with a draft of the cultural heritage assessment for review and comment.

Details of the consultation record are provided in Volume 2. The following Aboriginal stakeholder organisations were invited to attend the Wells Crossing to Iluka Road AFGs for the route options investigations prior to 2010:

- Yarrawarra Aboriginal Corporation (incorporating the Garby Elders Group).
- Grafton-Ngerrie Local Aboriginal Land Council (LALC).
- Yaegl LALC.
- Burra:way Wa:jad Traditional Owners Group.
- Yaegl Native Title Claimants Group.
- Birrigan Gargle Local Aboriginal Land Council.
- NSW Aboriginal Land Council.

3.4. Current consultation activities

3.4.1. Methodology

The consultation strategy adopted in 2010 was to ensure continuity from previous consultation. The primary aims of the current consultation strategy were to:

- Re-engage stakeholders who had not been contacted since the route options investigation AFGs in 2005.
- Transition to the ACHCRP process.
- Inform registered Aboriginal parties that RMS has now selected a route and that assessment is now in concept design phase, rather than route options assessment.

Where possible, the RMS Aboriginal Cultural Heritage Advisor with knowledge of the consultation from Wells Crossing to Iluka Road attended AFGs. The current phase of consultation involved:

- Notification (including advertisement) for stakeholder registration for the AFG.
- Registration of registered Aboriginal parties for the AFG.
- Holding AFG meetings.
- Undertaking archaeological survey and sub-surface test excavations with the Aboriginal site officers nominated in AFG meetings.
- Providing assessment methodologies and statements of findings to the AFG and requesting comments.
- Providing stakeholders with a draft CHAR for comment. *(Pending)*
- Incorporating comments received on the CHAR into the final report. *(Pending)*

In addition to the AFG meetings, consultation with nominated Aboriginal site officers was incorporated as part of the archaeological survey. Typical items discussed were:

- Options for mitigation of impact to Aboriginal sites and PADs.
- Potential significance of Aboriginal sites.
- Information pertaining to any Aboriginal cultural sites.
- Previous survey coverage and findings.

3.4.2. Aboriginal focus groups 2010 - 2012

Over the course of undertaking this Aboriginal cultural heritage assessment, a series of AFG meetings were held to ensure stakeholders were meaningfully engaged and had an opportunity to provide input and comment on the process.

Table 3-4 Table 3-2 provides dates for AFG meetings held under this round of consultation. The minutes of these AFG meetings are provided in Volume 3.

Table 3-2 AFG meetings held for Wells Crossing to Iluka Road 2010 - 2012

Aboriginal focus group meetings	Dates
AFG1	19 August 2010
AFG 2	15 September 2010
AFG 3	5 October 2011
AFG 4	14 December 2011
AFG 5	26 June 2012

For AFGs 1 - 2, a background to the project was presented to the group. Discussions were held over large-scale plans showing the project design boundaries, previously surveyed areas and registered Aboriginal sites and PADs. A separate plan for each AFG relevant only to their area was provided at the meetings. The primary aims of the first round of AFG meetings were to:

- Explain the concept design phase of project.
- Inform the Registered Aboriginal parties that further targeted archaeological survey was proposed along the project corridor (following identification of gaps in survey coverage) and present the methodology for this survey.
- Request Aboriginal site officer assistance with that survey (following the RMS procedures for engagement).
- Discuss any issues arising from the presentation and discussion.

Two AFG meetings were held after completion of the field survey. The primary aims of these were to:

- Present the results of the archaeological survey.
- Discuss the significance of any new Aboriginal cultural heritage sites recorded within the project corridor.
- Discuss potential mitigation strategies for sites recorded in the project corridor.
- Present the archaeological and cultural methodologies for assessment of PADs in the project corridor.
- For the December 2011 meeting, preliminary results were also presented for the sub-surface testing that had been completed.

After the majority of the sub-surface testing program had been completed AFG 5 was held. The primary aims of this AFG meeting was to:

- Present the results of the sub-surface testing program.
- Discuss the significance of the Aboriginal cultural heritage sites recorded within the project corridor.
- Discuss management recommendations, including the development of salvage and protection requirements.

3.4.3. Notification, identification and registration of stakeholders

Letters were sent to a number of agencies on 19 October 2010 with a closing date of 3 November 2010, seeking names of Aboriginal people who may have an interest in the project corridor and who hold knowledge relevant to determining the cultural significance Aboriginal objects and/or places. These agencies were

- The Office of the Registrar of the *Aboriginal Land Rights Act 1983*.
- OEH.
- Relevant LALCs.
- Relevant local councils.
- The National Native Title Tribunal.
- Native Title Services Corporation Limited.
- Northern Rivers Catchment Management Authority.

The OEH nominated 11 potential stakeholders. Letters were sent on the 11 November 2010 to those nominated stakeholders seeking registration of interest. The closing date for registration was 2 December 2010 with an AFG scheduled for 8 December 2010. Stakeholders were made aware of this meeting date as they registered, and were followed by a formal invitation two weeks prior to the meeting (approximately 25 November 2010).

Advertisements appeared in November 2010 in the following publications:

- *The Northern Star* (next available).
- *Ballina Shire Advocate* (11 and 25 November).
- *National Indigenous Times* (11 and 25 November).
- *Deadly Vibe Magazine* (November issue).
- *In Vibe Magazine* (November issues).
- *The Koori Mail* (3 and 17 November).

During the first round of AFG meetings, it was noted that additional Native Title claimants may exist for the project corridor. A Native Title search was conducted on 2 September 2010 (refer to Table 3-3) and new Native Title claimants identified as stakeholders were included in any subsequent consultation. A Native Title search was also conducted in February 2012 to check for any new groups; no new groups were identified.

Table 3-3 Native Title claimants relevant to Wells Crossing to Iluka Road; no Native Title holders exist for the project sections 4-6

Aboriginal focus group	Project sections	Native Title group
Wells Crossing to Iluka Road Iluka Road to Woodburn Woodburn to Ballina	3 – 11	Bandjalang People (2)
Wells Crossing to Iluka Road	4 – 6	Baryulgil Bundjalung

Aboriginal focus group	Project sections	Native Title group
Wells Crossing to Iluka Road	4 – 6	The Yaegl People

3.4.3.1. Summary of issues raised at Aboriginal focus group meetings

The following issues were raised at the first round of AFG meetings:

- Concerns were raised by Aboriginal stakeholders over the restrictions placed on pay rates by the PACHCI document. At the Wells Crossing to Iluka Road AFG the consequential lack of scope for the negotiation of rates by individual Land Councils or groups was the major concern with relation to the PACCHI document.
- At the Wells Crossing to Iluka Road AFG, Grafton-Ngerrie LALC expressed discontent with the way consultation was undertaken on the Glenugie project ie the survey was deemed complete by the consultant even though Grafton-Ngerrie LALC requested more survey due to heavy vegetation present.

The following issues were raised at the post-survey AFG meetings:

- At the Wells Crossing to Iluka Road AFG Rod and Brett Duroux (Grafton-Ngerrie LALC) raised concerns over the way consultation was to take place and reiterated their discontent with the outcomes of the Glenugie project. They also expressed concerns at the introduction of the PACHCI document during the course of the project as it has no provision for site monitoring during construction.

The following issues were raised at the post-excavation AFG meetings:

- At the Wells Crossing to Iluka Road AFG, Rod and Brett Duroux (Grafton-Ngerrie LALC) raised concerns over the way consultation was to take place and reiterated their discontent with the outcomes of the Glenugie project. They also expressed concerns at the introduction of the PACHCI document during the course of the project as it has no provision for site monitoring during construction.
- Wes Fernando (CEO, Grafton-Ngerrie LALC) said that there hadn't been enough notice for him for the AFG meetings, and that he would prefer 4 weeks' notice.
- Rod Duroux (Grafton-Ngerrie LALC) said that he would like to inspect the ground surface following vegetation clearance for the project to look for artefacts. He said that this had been agreed for the Glenugie project, but not undertaken. Graham Purcell (Cultural Heritage Advisor, Northern Region, RMS) said that this was not in-line with RMS and OEH policies (eg PACHCI). Rod Duroux and Wes Fernando (Grafton-Ngerrie LALC) said that this showed disrespect for cultural values and recommendations, with too heavy a focus on archaeological recommendations. Discussion was made and it was agreed that a move in the right direction would be to do inspections after vegetation clearance within proximity of identified sites.

3.4.4. Participation in fieldwork

During fieldwork, nominated Aboriginal site officers were engaged to assist with the identification and investigation of sites and PADs during survey and sub-surface test excavations, as well as to identify any cultural places. Site officers in attendance at during those surveys are detailed in Table 3-4.

Notable comments from site officers during that fieldwork included:

- From Yarrawarra site officers, details of importance and sensitivity of landforms in the respective areas (incorporated into Chapter 5) and discussion of type, scope and methodology for potential further investigation (eg survey, sub-surface testing, etc) (incorporated into Volume 2).

The above described sites and places are detailed further in Section 5.5.

Table 3-4 Site officers participating in field assessments

Organisation	Name	Role	Dates of participation
Yarrawarra Cultural Centre (Garby Elders)	Tim Cowan	Senior Aboriginal Site Officer (volunteer)	25 August 2010
Yarrawarra Cultural Centre (Garby Elders)	Milton Duroux	Senior Aboriginal Site Officer	25 August 2010 7 October 2011
Yarrawarra Cultural Centre (Garby Elders)	Anthony Dootson	Trainee Aboriginal Site Officer	25 August 2010 7 October 2011
Yaegl LALC (also Yaegl People Native Title claim)	Mark Laurie	Trainee Aboriginal Site Officer	25-27 August 2010
Yaegl LALC	Ferlin (Lee) Laurie	Senior Aboriginal Site Officer	24 – 27 August 2010 25 October 2011 – 20 November 2011 12–18 December 2011 27 – 28 February 2012
Yaegl LALC	Dale Mercy	Senior Aboriginal Site Officer	25 October 2011 – 20 November 2011 12–18 December 2011
Yaegl LALC	Shane McLeay	Aboriginal Site Officer	25 October 2011 – 20 November 2011 12–18 December 2011 27 – 28 February 2012
Yaegl LALC	Petunia Kapeen	Aboriginal Site Officer	7–13 November 2011
Grafton-Ngerrie LALC	Rodney Duroux	Senior Aboriginal Site Officer	7 October 2011

Organisation	Name	Role	Dates of participation
Grafton-Ngerrie LALC	Wes Fernando	CEO	7 October 2011
Birrigan Gargle LALC	Ronald Williams	Trainee Aboriginal Site Officer	25 – 27 August 2010
Birrigan Gargle LALC	Malcolm Brown	Aboriginal Site Officer	25 October 2011 – 20 November 2011 12–18 December 2011 27 – 28 February 2012

3.4.5. Aboriginal stakeholder comment on cultural heritage assessment report

The final draft of this CHAR and associated archaeological assessment and appendices were provided to stakeholders for comment on 26 June 2012. Comments and recommendations made within 8 weeks of this date by Aboriginal stakeholders are summarised in Table 3-5 and included in full in Appendix E. Changes requested and based on comments were considered and were incorporated into this CHAR where possible.

Table 3-5 Comments received from Aboriginal stakeholders on the draft CHAR between Wells Crossing and Iluka Road

Registered stakeholder group	Received comments?	Comments
Yarrawarra Aboriginal Corporation (incorporating the Garby Elders Group)	Yes	They have looked over some parts of the CHAR; they said the reports were good, and they are happy with the recommendations.
Grafton-Ngerrie LALC	Yes	Received a 5 page list of comments stating general unhappiness with the process of consultation and the recommendations. Also requested that some legislation needed to be added to the relevant sections.
Yaegl LALC	Yes	No concerns with the current recommendations. They acknowledge that they participated in the fieldwork and the recommendations for the Wells Crossing to Iluka Road section.
Birrigan Gargle LALC	Yes	No concerns with the current recommendations and they are very happy with the CHAR. It has been presented to the Board and they were satisfied with CHAR. Norma (CEO) has been to most of the AFGs and the site officers had participated in the fieldwork; the Board were satisfied with the outcomes.
Burra:way Wa:jad Traditional Owners Group	No	CHARs were returned ('not at this address') and the phone number was not connected.
Yaegl Native Title Claimants Group	Yes	Have provided comments through other channels, solicitor said this was through the Land Councils.

3.5. Consultation with government agencies

Consultation was undertaken with government agencies throughout the project, including with the Department of Planning and Infrastructure (DP&I) to gain Director-General's requirements.

Regular consultation was undertaken with OEH/EPA to ensure alignment of values, approach and methodologies. Regular meetings were held to discuss the approach proposed, and requesting comments, particularly in regards to transitioning from previous requirements to current requirements (eg ACHCRP, and the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales [OEH 2010]). The methodologies and research design for proposed investigations were discussed with OEH during these meetings, prior to their implementation. Meetings also discussed impacts to sites and places and appropriate ways to manage these.

4. Existing environment

This chapter provides an overview of the land use, cultural, geological conditions that characterise the sections of the project corridor between Wells Crossing and Iluka Road.

The information provided relates specifically to those factors which affect archaeological site distribution and preservation. Interpretation relating to landforms, geology, soils, and vegetation are made from an archaeological perspective and may not necessarily accord to scientific reports on these subjects. For example, descriptions may be different than that standard to geology and geography.

Land systems are mutually exclusive complexes that contain similar environmental components such as climate, geology, landform, soil and indigenous vegetation (Rowan 1990). Land systems form useful discrete units for describing and analysing the landscape.

4.1. Regional context

This review of the existing environment is arranged into land systems in order to build a context for the archaeological assessment. Several land systems occur within the project corridor and are summarised in Table 4-1.

Table 4-1 Summary of land systems within the project

Project section	Land system	Location within/near the project corridor	Specific landscape characteristics
2, 3, 4, 5 and 6	Clarence River Valley	Grafton, Tyndale, Harwood, Iluka and Yamba	The Clarence River flows roughly parallel to the project corridor north-easterly direction on the western side, and divides into the subsidiary streams of the North and South Arms south of Grafton. The project corridor intersects the main arm of the Clarence River at Harwood, while the North Arm is crossed at Woombah. The Clarence River floodplain is an undulating plain consisting of low rises, levees, terraces and depressed flood channels, and is made up of Quaternary gravel, silt, alluvium, sand and clay deposits. The Quaternary alluvium may retain archaeological deposits in aggrading landform contexts.
	Coastal range		To the east of the floodplain is the Coast Range, which is a north-south aligned range sitting on the Kangaroo Creek Sandstone and Grafton Formation geological features. The eastern face of this range consists of steep escarpments, while more moderate slopes exist on the western face. Associated rock types here include sandstone, siltstone, claystone, and conglomerate (Navin Officer 2009a).

4.1.1. Land systems

The coastal plains in the south of the project corridor (section 1) consist of extensive low-lying alluvial, aeolian, and estuarine swamp deposits occurring between the dune landscapes of the beach and low-lying hills. Inland from these coastal plains (though outside the project corridor) are the Coramba Beds, which form a lowland range of spurs, ridges and hills. The sedimentary and metamorphic rocks present in this area include greywacke, quartzite, chert and slate – these potential Aboriginal raw material sources may have been quarried directly, or collected in cobbles from streams originating there. The Dirty Creek Range (sections 1 and 2) consists of a series of geological units dating to the Jurassic and Cretaceous periods, and comprise sandstone, shale and quartz pebble conglomerate (Kuskie 2008). These units tend to have very shallow top soil associated with them, especially in cleared land and land subject to forestry due to erosion.

The foothills and slopes of the Richmond Range is extrusive in several locations across the Clarence River floodplain, and intersects the project corridor in several locations in sections 3 and 4. The Richmond Range is based on the Kangaroo Creek Sandstone Beds, which outcrop around the Clarence and Richmond River valleys. This formation continues further south to the west of the Dirty Creek Range, northeast of Woolgoolga, where it is joined by the Grafton Formation. These formations contain siltstone, claystone and sandstone deposits. Large rock shelters occur within the sandstones, which may have been used as campsites and/or for the execution of art by Aboriginal people (Kuskie 2008).

The Clarence River valley is an expansive, generally flat to undulating valley, and includes many tributaries (such as Shark Creek), meanders and arms of the Clarence River. The Clarence River floodplain consists of soft alluvium of depths between 14 metres and 22 metres, overlying bedrock.

4.1.2. Geology and geomorphology

South of the Richmond River the surface sediments consist of the Pleistocene coastal plain, a Quaternary sand, silt and clay unit in barrier dune formations trending east–west. The Pleistocene coastal plain with its sand, silt and clay sediments underlies the Broadwater National Park, south of the Clarence River.

The Beenleigh Block bedrock is the basement unit in the region. This consists of grey-green coarse grained sandstone and slate, which has been slightly metamorphosed. Local quartz veins have also been altered by pressure and temperature. The bedrock can exhibit turbidite facies, a layering of sediments consistent with deep marine deposition in the Carboniferous period, approx 350 million years ago. Basement rocks of the Beenleigh Block outcrop in several small areas south of the Richmond River. These resources have been identified and utilised at local quarries such as Cooks Hill.

North of the Richmond River, the project corridor follows the eastern boundary of the Blackwell Ranges, which are determined by the outcropping bedrock. The project corridor then traverses series of Holocene alluvial deposits on the floodplain from Saltwater Creek to Ballina. The more successful farming areas south of Woodburn are underlain by mud, silt and clay of the Holocene estuarine plain, a younger landscape deposited onto the Pleistocene landscape.

The stone most frequently quarried in NSW by Aboriginal people was silcrete, with chert, quartz and quartzite extraction also being relatively common (DPI 2007)..

Chert is a fine-grained silica-rich microcrystalline sedimentary rock. Chert usually forms as a nodule in a sedimentary rock such as a limestone, which has been subject to pressure or temperature change after its initial deposition. Chalcedony is similar to chert in composition. However, in microscopic view it will have a more fibrous growth habit.

Stone was mined from boulders, exposed veins or blocks, conglomerates and from deposits of pebbles or cobbles and gravel. Mining was by extraction from surface deposits and by excavation below the surface (DPI 2007).

4.1.3. Vegetation

Before European colonisation, the native vegetation of the project corridor largely comprised dense gallery rainforest stands, which covered the Clarence River Valley floodplain and the coastal ramp land system around the Alstonville Plateau and Blackwell Range in the north of the project corridor (Collins 2005: 9). Much of this vegetation has been cleared for cattle grazing and agriculture, particularly for the sugar cane plantations. Some areas have been more heavily cleared than others. The rainforest of the Clarence River Valley floodplain, for example, has been heavily disturbed due to these activities more than other areas. The timber milling industry also led to the clearing of natural vegetation in the Woolgoolga area. Despite the extensive clearing, stands of the original vegetation survive.

At present, tall, open hardwood forests occur mainly within the State Forests and National Parks and Nature Reserves along the coast, such as the Glenugie, Tabbimoble, Devils Pulpit and Pine Brush State Forests. These forests are dominated by species such as grey gum, spotted gum and red mahogany, with acacia shrubs forming a dense understorey. These forests also occur on areas of Crown land and private land that have not been subject to clearing, such as on the slopes of the Coast Range near Woolgoolga in section 1 (Collins 2008). The drainage depressions and alluvial plains also support tall swamp vegetation with broad-leaved paperbark (Collins 2008: 5).

4.2. Ethnographic record

4.2.1. Aboriginal tribal boundaries

A total of four Aboriginal language groups are represented along the project corridor:

- Bundjalung.
- Nyangbal.
- Yaegl (Yaygir).
- Kumbainggiri (Gumbaynggir).

The Bundjalung inhabited the region north of the Clarence River to the Logan River in south-east Queensland. Speakers of the Nyangbal language group occupied the region east of Bundjalung along the coastal plain and encompassing Ballina.

Prior to European colonisation, about 20 different dialects of the Bundjalung language were spoken north of the Clarence River to the Logan River in south-east Queensland (Collins 2005). The ethnohistoric record suggests that the lower Richmond supported one of the densest Aboriginal populations in Australia (Collins 2005). The Aboriginal population appears to have been concentrated along the coast however densities of up to one person per 2.5 square kilometres

have been proposed for the riverine corridor. Gollan (nd cited in Collins 2005) reported that 200 to 300 Aboriginal people would gather at Woodburn for a tribal fight and corroboree. In the foothills of the coastal ramp, which lacked resources, populations were smaller approximately one person per five square kilometres (Pierce 1971).

The lower Clarence River was occupied by Yaegl (Yaygir) Aboriginal people, who were the southern neighbours of the Bundjalung. The Clarence River separated these two Aboriginal groups who were associated with distinctly different languages (Tindale 1940; Crowley 1978). According to Crowley (1997), this type of sharp linguistic discontinuity could have arisen as a result of different populations moving from the initial river mouth concentrations north and south along the coast and eventually meeting in the middle between the major rivers. On Friday 12 August 1799, Mathew Flinders recorded an Aboriginal settlement at the mouth of the Clarence River (Piper 1982). Flinders described large dome shaped bark huts, baskets, nets and other evidence that suggested that the occupants of the Iluka area pursued a hunting/fishing economy supplemented with vegetable foods.

According to Tindale (1940), the Kumbainggiri occupied the headwaters of the Nymboida River across the range to Urunga, Coffs Harbour, Bellingen, Glenreagh and Grafton, west of the Yaegl language group. The Kumbainggiri spoke a language belonging to the Kumbainggeric Group. According to Crowley (1979), Yaygir (Yaegl) and Gumbaynggir originated from the same proto-language to become distinct sub-groups on their own. As this tribal group covered such a large, environmentally diverse area it is probable that the language contained three or four dialects and supported a population of between 1200 and 1500 people (Hoddinott 1978).

4.2.2. Social organisation

Peterson (1976) described Aboriginal society as being comprised of a hierarchy of organisational levels and groups with fluid boundaries between them. The smallest group in the hierarchy is the family comprised of a man with one or more wives, their children and some of their parents. The second level of the hierarchy consisted of bands, small groups consisting of members of several nuclear families who conduct hunting and gathering tasks together for most of the year. The third level of the hierarchy consists of regional networks which comprise a number of bands. Members of these regional networks usually hare beliefs in a common language dialect and assemble for specific ceremonies. The ‘tribe’ is the next highest unit which is recognised as a linguistic unit with flexible territorial boundaries. The highest level of the hierarchy is the ‘cultural area’, which consists of groups who share certain cultural characteristics, such as initiation ceremonies and closely related languages.

4.2.3. Settlement patterns

Although Aboriginal groups remained within their own territories, long distance travel was often undertaken to attend social and ceremonial events and to exchange goods between the north coast river systems (Collins 2005). Further inland, shifting camp seems to have been frequent, occurring as often as monthly. Camps were usually constructed in dense sheltered scrub and consisted of bark shelters sufficient to accommodate a few occupants from the rigours of the weather. According to Coleman (1982), Aboriginal occupation along the coastal zone was largely sedentary, with people limiting their movements to small territories that could support their subsistence needs.

At the time of European settlement, both the Yaegl and Bundjalung peoples comprised a number of separate, but interrelated groupings, each associated with a specific geographic area (Collins 2008). These groups shared economic resources and ceremonial occasions, traded with one

another, intermarried, and spoke a mutually intelligible language. According to Belshaw (1966), the Aboriginal population density ranged from one person per square kilometre on the Richmond coastline, to one person per approximately 50 square kilometres in the escarpment ranges. Early European accounts indicate that no land system was completely abandoned by Aboriginal people at any time of the year.

4.2.4. Material culture

The majority of the region's material culture (shields, spears, boomerangs, clubs, digging sticks, canoes, containers and woven nets and bags) were made from wood or other vegetative material that is rarely recognisable in the archaeological record. A limited assemblage of artefacts more conducive to presentation has been recorded, including hafted stone hatchets used to cut possums and bees nests from trees, stone knives used in scarification and to cut women's hair, slivers of sharpened shell for sundry cutting tasks, bone tools to soften and engrave designs on skin rugs and bone needles used when sewing skins together (Bundock 1898; Dawson 1935; Flick 1934).

4.2.5. Resources

Ainsworth (1922, cited in Collins 2005) partially reconstructed the traditional Aboriginal resource base and environmental context from which the principal resources originated. Although shellfish and rainforest resources such as yams and flying foxes were regularly consumed, Ainsworth's (1922) description primarily concerns fishing methods. Nets were reportedly used in the narrow and shallow waters of the estuary. In addition, fern and rush roots, birds, marsupials, reptiles, wattle seed, blue flax lily fruit, roots and fibre, grubs, eels, tortoises, and pine rafting resin would also have been utilised (Maiden 1889; Bundock 1898; Bray 1901; Petrie 1904; Flick 1934; Simpson 1956; McBryde 1982; Byrne 1986).

Goods and resources would have been exchanged between Aboriginal groups in the Clarence and Richmond River Valleys. Axes manufactured from greywacke pebbles collected from the mid Clarence River gravels have been recovered at both Woombah and Woodburn, east and north of the study area respectively (Binns and McBryde 1972). Resource exploitation appears to have been undertaken by family groups and often several families would co-operate to form a highly flexible 'band' that would gather and then separate as conditions demanded (Godwin 1990).

A wide variety of mammals, birds, fish and vegetable foods contributed to the Aboriginal diet and all the available habitat types were exploited (Collins 2008). Resources mentioned in early ethnohistoric sources include koalas, possums, kangaroos, wallabies, echidna, bandicoots, goannas, snakes and various birds, all available in the sub-coastal forests of the Clarence-Richmond divide. Faunal remains recovered at Woombah reveal that Aboriginal people were largely reliant on estuarine foods, such as oysters (McBryde 1982). Although no vegetable products were represented archaeologically, McBryde (1982) suggested that these would have been regularly exploited.

The environment differed greatly before the arrival of non-Aboriginal people to the region. Broad rivers flowed through thickly forested plains with occasional grasslands and densely treed mountain ranges (Hoff 2010). Much of the region from the Logan River to the mouth of the Clarence River was thickly forested particularly along the fertile lowland flats that bordered the winding rivers as they flowed to the sea (Hoff 2010). The rainforests "...teemed with animal and bird species..." while networks of paddymelon and wallaby tracks were evident in the undergrowth, and pigeons and other edible birds swarmed the trees (McKenzie-Kelly family cited in Hoff 2010).

4.2.6. Spiritual locations and culture

Initiation ceremonies of the north coast reportedly involved the gradual revelation of sacred information and a corresponding growth in social and economic status (Collins 2005). Bundjalung males passed through at least two degrees of initiation before becoming full members and were permitted to marry. The major initiation ceremonies were undertaken at Bora grounds. Women also reportedly had their own initiation grounds and associated rites (Winterbotham 1983).

Radcliffe-Brown (1929) reported that sacred spots known as 'Djurebil' (also more generically called 'increase sites') were located throughout Bundjalung country. These spots were often marked by a natural feature such as a water-hole or a significant rock or group of trees. Initiated people performed rites at each djurebil within their territory to ensure the maintenance and well-being of the associated species or resource. According to Oakes (1979), Djurebils were 'rogation spots' where the sacred being was ceremonially asked to make a certain natural resource more plentiful.

4.2.7. European and Aboriginal interaction

Rich (1989) identified several stages and themes in the history of contact between Aboriginal people and non-Aboriginal settlers. Initially interaction was reportedly amicable, though degenerated into violent clashes. Aboriginal people were employed as cedar spotters and labourers; however, when cedar supplies diminished, widespread land clearance was conducted along river valleys and further upstream within mountainous localities. Cedar getters travelled by boat up the Clarence River in 1837 and met with friendly Aboriginal locals, whose only previous and amicable interaction had been with convicts and ships crews (Hoff 2010). Initially, Aboriginal people shared the location of large trees with the cedar getters, possibly oblivious to actual intent of the foresters. Interaction between the cedar getters and Aboriginal people reportedly became tense, *The Monitor* claiming that "...these 'drunken sawyers' travelled the river well armed, [and] provoked the Aborigines to reprisals and shot them when the situation became out of hand" (Hoff 2010).

Following the *Robertson Land Act* in 1861, contact between Aboriginal and non-Aboriginal people intensified, which resulted in the systematic dispossession of Aboriginal people from their land. Following the spread of disease and violent resistance, Aboriginal people became reliant on European settlers and were often employed as stockmen, shepherds and servants on grazing properties (Rich 1989). This marked the beginning of the fringe-dwelling period which continued well into the 20th century.

In the latter part of the 19th century, there was a growing concern for Aboriginal people in NSW which resulted in the forming of the Aborigines Protection Association in 1881 (Kuskie 2008). In 1883, the Government established a Board of Protection of Aborigines to achieve a "more systematic and enlightened treatment of Aborigines". Rural stations were created so that Aboriginal people could remain on tribal territory. In north-eastern NSW, 126 reserves were established between 1883 and 1971 including at Coffs Harbour and Grafton (Burke 1997). Amendments to the *Aborigines Protection Act 1869*, however, allowed the board to forcibly move Aboriginal people onto reserves well away from tribal areas and control all aspects of their lives. Further amendments enabled the board to forcibly remove Aboriginal children from their parents, a practice which was conducted throughout the first half of the 20th century.

4.3. Historical land use and current site condition

The north coast of NSW was first explored by Oxley in 1820, with settlement by non-Aboriginal (European) people continuing during the following decades (Byrne 1981). Past and present land use activities within the study area include sand quarrying, flood mitigation schemes, sugar cane production, cattle grazing, agriculture, timber milling and the construction of roads and dwellings. Sand quarrying was previously undertaken within the Broadwater area and the Bundjalung National Park in the north of the project corridor, which has led to the extensive disturbance of the coastal barriers in these areas.

The poor drainage of the alluvial plain has been largely overcome by the implementation of flood mitigation schemes, such as the construction of canals to drain the Tuckean Swamp north-east of Broadwater, and the construction of the Tuckombil Canal between Rocky Mouth Creek and the Evans River in the north of the project corridor (Collins 2005: 8). Extensive systems of small drainage channels have also been used to drain areas of the Richmond and Clarence floodplains for sugar cane farming.

The introduction of sugar cane production, cattle grazing and general agricultural practices led to the extensive clearing of much of the original rainforest and eucalypt forests in the project corridor. The major exceptions are the areas of State Forest and reserves, which in the areas to the west of Woodburn and Iluka, have been largely owned by the State for much of the post-contact period.

The first European settlers in the Richmond River area quickly discovered the fertile alluvial soils were suitable for growing sugar cane and maize. These crops could also be conveniently transported along the Richmond River to processing plants and markets, with the transport of sugar by river only ending in the 1970s. Cane was first introduced to the Wardell area in the north of the project corridor in the 1860s, and proved to be a more successful and lucrative crop than others which had been tried in the area, such as wheat and tobacco. The presence of the coast and the warmer climate to the east aided the growth of sugar cane and reduced the incidence of frost, making farming more successful here than in other areas further inland (Ballina Shire Council 2004). Sugar cane is now grown from Ballina south to Wells Crossing, with a mill at Broadwater.

Cattle have been grazed over much of the project corridor in both historical and modern times. The opening up of land for free selection in the 1860s and the passing of Land Acts by the NSW Government in the 19th century resulted in the expansion of farming lands. Many of the first farmers were actually timber cutters, who were required to improve their land by constructing buildings and cultivating their land after first clearing it (Ballina Shire Council 2004). Land clearances and general agricultural practices, such as ploughing, have resulted in the modification of large tracts of land throughout the study area.

Dairy farming was preceded in many areas by timber cutters, with cedar being a particularly desirable wood. Cedar-cutters had established themselves near Meerschaum Vale in the north of the study area by the 1850s, in order to access the cedar stands of the Big Scrub. The Big Scrub and other dry forests also yielded rosewood, teak, beech and pine (Ballina Shire Council 2004). The introduction of free selection removed many of the restrictions imposed on timber cutters, and allowed selectors to cut timber on their own land. Timber cutting and milling in the 19th century led to the logging of much of the original vegetation along the floodplains of the Clarence and Richmond Rivers.

The arrival of the cedar cutters and dairy farmers led to the expansion of settlements and other services required to supply the growing populations. Roads were often initially cut by early settlers, such as the timber cutters, and were then expanded by dairy farmers and other settlers who needed to transport goods to and from their homes. Road construction and maintenance later

became the responsibility of local councils, with funding for major roads supplied by the New South Wales Government (Ballina Shire Council 2004). The subsequent construction of roads and other forms of transport, as well as residential dwellings and commercial buildings, have disturbed the landscape throughout the study area.

The major land use activities associated with the project corridor presently are farming and agriculture including beef, wool, sugar cane, soybean and tea production. Other land uses include timber logging, conservation areas such as the State Parks and Forests, and urban land encompassing the larger townships and settlements and their associated commercial activities, such as service stations and caravan and holiday parks.

Figure 4-1 shows a modelled estimate of the accumulated impact on the landscape from post colonisation land-use. This mapping is derived from a DECCW online regional predictive model mapping tool (the Aboriginal Site Decision Support Tool).[2] Areas with high impact (shown in red/orange) are less likely to retain archaeological remains. Areas used for sugar cane farming such as many properties between Woodburn and Ballina around the Richmond River show up on this map in orange. These land uses are subject to relatively high degree of accumulated impact due to more than 100 years of clearing, followed by deep ripping for cane farming. Areas of much lower accumulated impact such as south-west of Woodburn (shown green to blue), include State Forests and National Parks. As can be seen in Figure 4-1, much of the project corridor traverses areas that have been subject to a high degree of accumulated impact. This suggests that less robust site types, such as human remains, shell deposits and scarred trees, are less likely to occur in the areas subject to higher levels of accumulated impact than areas subject to lower levels of impact. It also suggests that more robust site types, such as artefact scatters, are more likely to have lower integrity in the areas subject to higher levels of accumulated impact.

[2] Accessible at http://mapdata1.environment.nsw.gov.au/asdst/default.aspx; how the Aboriginal Site Decision Support Tool modeling was developed is described at http://www.environment.nsw.gov.au/licences/AboriginalSitesDecisionSupportTool.htm

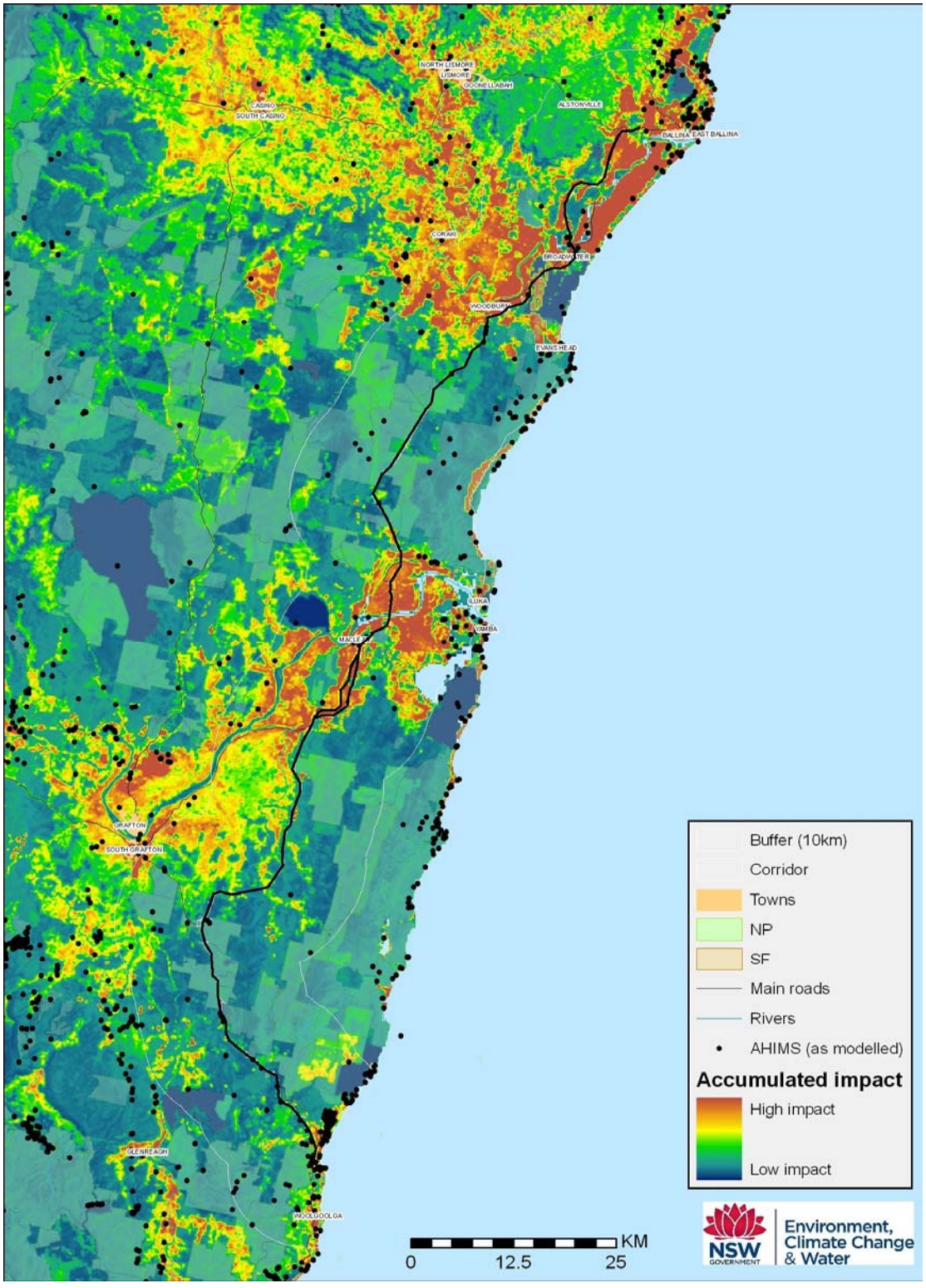


Figure 4-1 Accumulated impact from post-colonial land-use

4.4. AHIMS register search

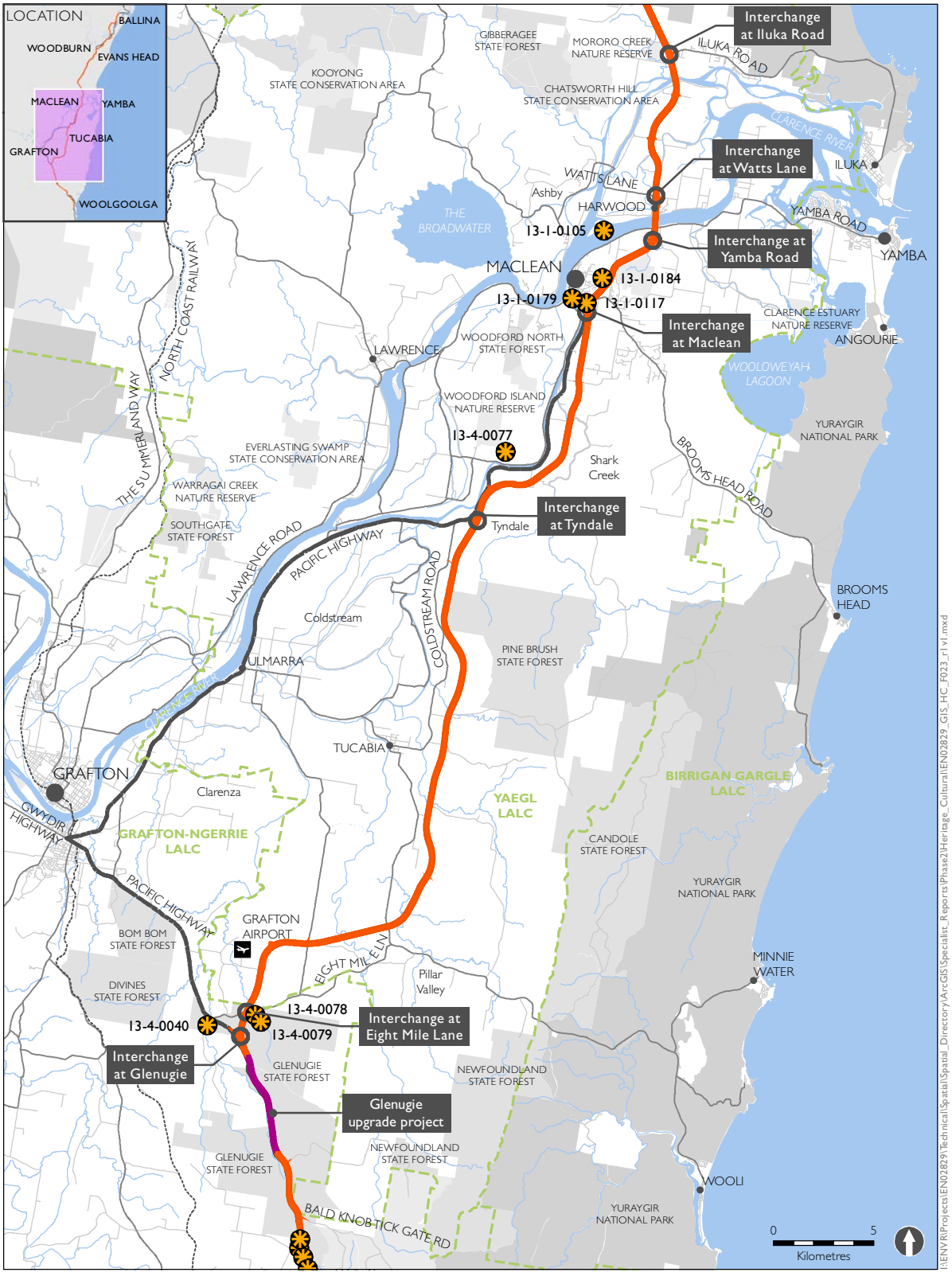
The AHIMS was searched in 2010 and updated in February 2012 for records relevant to the project corridor and surrounds.

It should be noted that these results are not an indication of all cultural heritage resources relevant to the project, as very few investigations have previously been undertaken within the project corridor. The AHIMS results list recorded sites only, and are more an indication of previous survey effort than anything else.

Table 4-2 Listings on AHIMS located within 200 metres of the project corridor

Project section	AHIMS ID	Site name	Easting/northing GDA 94 Zone 55	Site type	Landform	Distance from project corridor boundary (metres)
3	13-4-0078	Pheasant Creek	503380E/ 6704600N	Artefact Scatter	Flat	200 m
4	13-1-0117	Hillcrest Reserve	519880E/ 6740071N	PAD / Habitation Structure	Upper Slope	70 m

Figure 4-2 Wells Crossing to Iluka Road - Aboriginal heritage sites (registered on AHIMS)



5. Aboriginal cultural assessment

5.1. Introduction

The cultural assessment in this report includes cultural information collected during consultation, survey and sub-surface testing. The Aboriginal cultural assessment was undertaken by Robyn Jenkins, Vanessa Edmonds, and Joseph Brooke.

5.2. Methodology

The assessment involved consultation in a number of forms with knowledge holders as identified by the registered Aboriginal parties for the project (see Chapter 3 for further details of consultation). The cultural assessment was based on:

- Reviewing archaeological fieldwork and consultation conducted for the previous development project, by Navin Officer (2009a).
- Reviewing literature relevant to the project corridor and surrounding landscape.
- Consultation with elders and knowledge holders for the region during AFG meetings.
- Consultation with elders and knowledge holders (eg oral history recording, site visits with Elders).
- Consulting with Aboriginal site officers during field survey regarding Aboriginal objects and cultural values.

The information provided has contributed to an understanding of the cultural value of the broader landscape within which the project is located. Knowledge holders have provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of European land management practices on their traditional land, and subsequently their culture. The cultural assessment identified locations of Aboriginal cultural value within the project corridor.

5.3. Cultural landscape

The understanding and perception of the landscape expressed by the knowledge holders and the community is an area traversed by an interconnecting network of physical, social and spiritual places. The World Heritage Convention of United Nations Educational, Scientific and Cultural Organization (UNESCO) define an associative cultural landscape as one which has ‘powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant of even absent’ (UNESCO 1991). The relationship between Aboriginal Australians and the land can often be conceived in spiritual terms rather than primarily in material terms (Andrews *et al* 2006).

Aboriginal cultural knowledge has been defined as:

> *Accumulated knowledge which encompasses spiritual relationships, relationships with the natural environment and the sustainable use of natural resources, and, relationships between people, which are reflected in language, narratives social organisation, values, beliefs and cultural laws and customs* (Andrews *et al* 2006).

Aboriginal cultural knowledge was traditionally bequeathed through oral traditions from generation to generation. Within all Aboriginal communities there was a time of dislocation and upheaval associated with the arrival of European settlers. This widespread disruption resulted in the loss of varying degrees of detailed knowledge and understanding of many of the elements of the cultural landscape from Aboriginal communities. A recognition and concern regarding this loss of knowledge of the cultural landscape and the meanings embedded in the landscape was expressed by several of the stakeholders during consultation for the project (eg Anthony Dootson pers comm November 2010; Rod Duroux pers comm November 2011).

It should be noted that Indigenous communities across Australia are extremely diverse, and generally defy generalisation. The above descriptions are common conceptions of Aboriginal cultural landscapes and values, however, a large range of beliefs and practices are evident across Australia and uniformity should not be assumed.

5.4. Identified Aboriginal cultural heritage values

The previous and current consultation process with stakeholders and on-site discussions with Aboriginal site officers identified the following cultural heritage values within the landscape (Table 5-1).

Table 5-1 Cultural heritage values identified by registered Aboriginal parties

Cultural heritage value	Description
Resource gathering locations and techniques	Stakeholders identified that they still fish and collect wild food throughout the region (eg Milton Duroux pers comm August 2010). The techniques and primary resource gathering locations are known and passed on through generations.
Scarred trees	Stakeholders identified scarred trees as being of sacred and ceremonial significance (eg Rod Duroux pers comm August 2011). This was due in part to these being some of the only 'markers' remaining in the landscape as a result of European agricultural practices In the project corridor region , scarred trees also mark ceremonial sites such as bora rings, and occasionally burial sites.
Pathways through the landscape	Across the entire project corridor registered Aboriginal parties identified numerous pathways that lead from the ranges to the coast. These pathways also link spiritual and ceremonial sites (eg Milton Duroux pers comm August 2010; Rod Duroux pers comm November 2011). During the current field survey, Aboriginal Sites Officers identified the importance of spurs and ridgelines as a route for travel through the landscape (eg pers comm Ferlin Laurie August 2010). These pathways were generally a link between the coastline and the mountain ranges. These pathways link spiritual and ceremonial sites, artefact scatters often occur along these pathways, as well as scarred trees which may be located at junctions, or other significant points in the pathways (Dale Mercy pers comm October 2011).
Water courses, water holes or springs	Permanent water bodies are culturally significant as central locations for gathering of people, resource collection and camping. Watercourses are often associated with spiritual beings (Ferlin Laurie pers comm August 2010).
Aboriginal plants and animals	Aboriginal plants and animals are significant to traditional owners. During the consultation process animals and plants were often mentioned in context of resource collection and spiritual importance (Dale Mercy pers comm October 2011).
Burial sites	Burial sites are of great importance and generally are of high concern to Traditional Owners (eg Milton Duroux pers comm August 2010) as the location

Cultural heritage value	Description
	of burials is rarely documented. Anecdotal evidence of burials needs proper consideration.
Areas of spiritual significance	The strong attachment that traditional owners have to the project corridor and surrounding landscape is evident through their Dreaming stories and social connections (eg Anthony Dootson pers comm August 2010; Rod Duroux pers comm August 2011; Milton Duroux pers comm August 2010). Stories relating to creation beings *Birrugan*, and *Mindi* and *Baiamie* link a number of places across the district including Yamba, Woodburn, Tyndale, and the Clarence and Richmond Rivers.
Post-contact sites	Post-contact sites are those which have gained significance to Aboriginal people after the arrival of European settlers.
Massacre sites	These are of great importance to the Traditional Owners, and are often difficult to discuss (various pers comm 2010, 2011, 2012).

5.5. Aboriginal cultural places within or adjacent to project corridor

The cultural assessment has identified four Aboriginal cultural places within or adjacent to the project corridor[3]. Details of each of these cultural places and their locations are listed in Table 5-2 and maps showing their approximate locations are provided in Volume 2.

[3] Aboriginal Places are not gazetted Aboriginal Places under S86(4) of the NPW Act, but Places of local significance identified during the community consultation process.

Table 5-2 Aboriginal cultural places within 200 metres of the project corridor

Project section	Place name	Information
3	Tyndale and Woodford Island corridors of movement	There are Yaegl oral history accounts of an Aboriginal massacre site and an important traditional Aboriginal pathway, which crossed the south arm of the river and linked Tyndale with Woodford Island (Navin Officer 2009a: 23). This is believed to be in an area to the north of present-day Tyndale village, however, the exact location is not known.
3	Pillar Valley men's and women's sites	The Garby Elders advised that the Pillar Valley (including the Pillar Rock and nearby waterholes) is a significant men's place (Navin Officer 2009a: 23). There are also records of women's places occurring within the Pillar Valley.
3	Pillar Valley corridors of movement	Traditional travel routes leading from Pillar Mountain to the Bull Paddock traverse the project corridor at Wells Crossing and another near to the north (Kuskie 2008; Milton Duroux and Rod Duroux pers comm August 2011). Historically known camp sites occur along these travel routes. The Garby Elders also identified the Coldstream River as an important corridor linking significant areas at Glenugie, Pillar Valley and Tyndale (Navin Office 2009a: 23).
2, 5, 10	Birrugan and Mindi spiritual sites	The creation of Glenugie Peak involved two ancestors; Birrugan and Mindi (his elder). The two fought over food and Birrugan became so angry that he piled all of the yams he was collecting into a mound, which became the Glenugie Peak (Gumbaynggir Language and Cultural Group 1992 cited in Navin Officer 2009a: 23.

5.6. Aboriginal cultural places near the project corridor

Other Aboriginal cultural places that were identified during consultation and from the cultural heritage reports, but are not within the immediate vicinity of the project corridor include those listed in Table 5-3. For further details of these places, see Collins 2005.

Table 5-3 Aboriginal cultural places near the project corridor

AHIMS ID	Site name	General location	Information
NA	Clarence Peak Sacred Site	Clarence Peak	Clarence Peak is reportedly a very significant mountain with associated significant sites and is of cultural significance the Burra:way Wa:jad Traditional Owners Group (Navin Officer 2009).
NA	Iluka Sacred Sites	Iluka	The Iluka area is reportedly the location of important occupation and sacred sites and is of cultural significance to the Burra:way Wa:jad Traditional Owners Group (Navin Officer 2009).
NA	Bom Bom Ceremonial Sites	The Bom Bom Area	The Bom Bom area is reportedly associated with ceremonial sites, burials and other significant sites associated with historic Aboriginal encampment ('The Four Mile') in South Grafton. The area is culturally significant to the Burra:way Wa:jad Traditional Owners Group (Navin Officer 2009a).
NA	Ulmarra Historic Site	Ulmarra	A large historic Aboriginal encampment existed at Ulmarra and is of cultural significance to the Burra:way Wa:jad Traditional Owners Group (Navin Officer 2009a).
NA	Coldstream River Corridor	Coldstream River	The Garby Elders identified the Coldstream River as an important corridor linking other significant areas such as Glenugie, Pillar Valley and Tyndale (Navin Officer 2009).
NA	Pillar Valley Sacred Site	Pillar Valley	The Garby Elders identified Pillar Valley (including Pillar Rock and nearby waterholes) as significant men's places (Navin Officer 2009a). Pillar Valley is also recognised as a culturally significant site to the Burra:way Wa:jad Traditional Owners Group.
NA	Gulmarrad Pathways	Gulmarrad	The Yaegl LALC advised that there are pathways to former ceremonial sites in the vicinity of Gulmarrad (Navin Officer 2009a).
NA	Glenugie Peak	Glenugie Peak	A Gumbaynggir story explains the creation of Glenugie Peak: Two hero-ancestors, Birrugan and Mindi (his Elder) fought over the collection of food. Birrugan became angry with Mindi and piled all of the Yams he was collecting into a pile which became Glenugie Peak (Gumbaynggir Language & Cultural Group 1992 cited in Navin Officer 2009a). Glenugie Peak is also recognised as a culturally significant site to the Garby Elders.
NA	South Grafton Swamp	Grafton Racecourse, South Grafton	A Gumbaynggir story is associated with a swamp near the former Grafton Racecourse: A group of Gumbaynggir were keeping all the large eels for themselves, away from the remainder of the group. Birrugan (a hero-ancestor) then came and took a large eel from the swamp and put it into the Clarence River. From then onwards the swamp had only small ells and river had large eels (Gumbaynggir Language & Cultural Group 1992 cited in (Navin Officer 2009a).

6. Summary of archaeological assessment

This section summarises the archaeological assessment undertaken as part of this report. The full archaeological assessment for Wells Crossing to Iluka Road can be found in Volume 2 (Appendix A), which accompanies this document.

The archaeological assessment was undertaken by fully qualified and experienced archaeologists and heritage consultants, primarily Joseph Brooke (Bachelor of Archaeology (Honours), 6 years experience), Robyn Jenkins (Bachelor of Arts, Bachelor of Social Science (Honours), and 5 years experience), and Vanessa Edmonds (Bachelor of Arts, Master of Letters, 25 years experience).

Also presented here is a methodology for assessing the risk of impacting sites by a number of ancillary works proposed for the project corridor. As the proposed areas for the ancillary works were identified later in the assessment stage, they were not able to be subject to field investigation. As such, the areas would be subject to a separate Aboriginal archaeological report, and if required, an addendum to this CHAR.

6.1. Assessment methodology

The methodology of the archaeological assessment built on each of the stages listed below, through ongoing consultation and revision. The stages were broadly structured as follows:

1. Desktop assessment to develop a predictive model.
2. Survey program.
3. Sub-surface testing program.

All stages of the archaeological assessment included consultation and involvement with the registered Aboriginal parties Section 3.4.

Key to the archaeological assessment was the following steps:

- Reviewing existing data (including any previous investigations specific to the project corridor, AHIMS searches, etc) to identify any gaps in the assessments and to develop a predictive model to aid in identifying areas within the project corridor more sensitive to the discovery of archaeological sites. This specifically informed the survey program with previously identified PADs generally not subject to further survey.
- Developing a cultural heritage assessment methodology and consultation strategy. The methodology was presented to the registered Aboriginal parties for discussion and development prior to any fieldwork commencing.
- Undertaking field investigations (survey and sub-surface testing) with Aboriginal sites officers. Discussions regarding the methodology, PAD/site condition and initial management recommendations were also undertaken in the field.

- Recording and analysis of cultural material in the field, as material could not be removed off site.

6.2. Ancillary works assessment

In addition to the boundary of the project, ancillary areas are required adjacent to the boundary of the project for construction.

These areas were identified following the field investigations, and were consequently not able to be assessed during field investigations for this CHAR. As part of the cultural heritage investigation, these ancillary areas have been assessed at a desktop level to determine the potential risk of impact to Aboriginal heritage and identify whether any require further investigation to determine potential risk of impact, or recommending that the site's use as an ancillary area is modified. The areas were assessed against the following criteria:

- Approximate area outside of boundary of the project – all areas inside the boundary of the project were assessed as requiring no further investigation, as these have already been covered by the project assessment, any areas outside the boundary of the project were recommended for survey.
- Presence of site or cultural place within the ancillary site.
- Presence of site or cultural place within 25 metres of the ancillary site.
- Land system – to place the ancillary site within the predictive model developed in the archaeological assessment (Appendix A).
- Landform – to better contextualise the ancillary site within the predictive model.
- Potential archaeological sensitivity was used to inform whether and to what level investigation was recommended.

Potential archaeological sensitivity was assessed based on the predictive model (see Appendix A) using a combination of factors including landform, and proximity to a known site or PAD. Modelling by OEH was also used to inform potential archaeological sensitivity. This matrix then fed into an assessment of the risk of each ancillary works area impacting upon Aboriginal cultural heritage. Recommendations were then made for consultation and field assessment where the risk of impact to Aboriginal cultural values was not sufficiently known (ie where outside the boundary of the project), and/or where there was a known risk to impact Aboriginal cultural heritage values.

Broadly, the recommendations fell into four categories:

- Survey and consultation.
- Survey, sub-surface testing and consultation.
- Follow management recommendations proposed in Section 9.2.
- No further investigation.

At a minimum, for all ancillary areas that fell outside the boundary of the project, survey and consultation with registered Aboriginal parties was recommended, as the risk to Aboriginal cultural heritage was not sufficiently known. Additionally, sub-surface testing was recommended for those

ancillary areas outside the boundary of the project with higher potential archaeological sensitivity and/or those where there was a known Aboriginal cultural heritage site/PAD within or immediately adjacent to the ancillary area. Where an Aboriginal cultural place is identified partially or wholly within an ancillary area, further consultation with registered Aboriginal parties, and their approval would be sought regarding the appropriateness of the ancillary area and proposed works there. This process was discussed and accepted by registered Aboriginal parties during an AFG meeting.

For ancillary areas that fell within the boundary of the project where the main cultural heritage assessment in this report identified no specific Aboriginal cultural heritage values, the risk of impact to Aboriginal cultural heritage values was assessed as low and no further investigation was recommended. For ancillary areas that fell within the boundary of the project, and the main cultural heritage assessment in this report identified some Aboriginal cultural heritage value, then following the actions outlined in Section 9.2 was recommended.

The ancillary area assessment matrix table can be found in Appendix F. The specific recommendations to manage the investigations are found in Figure 6-1.

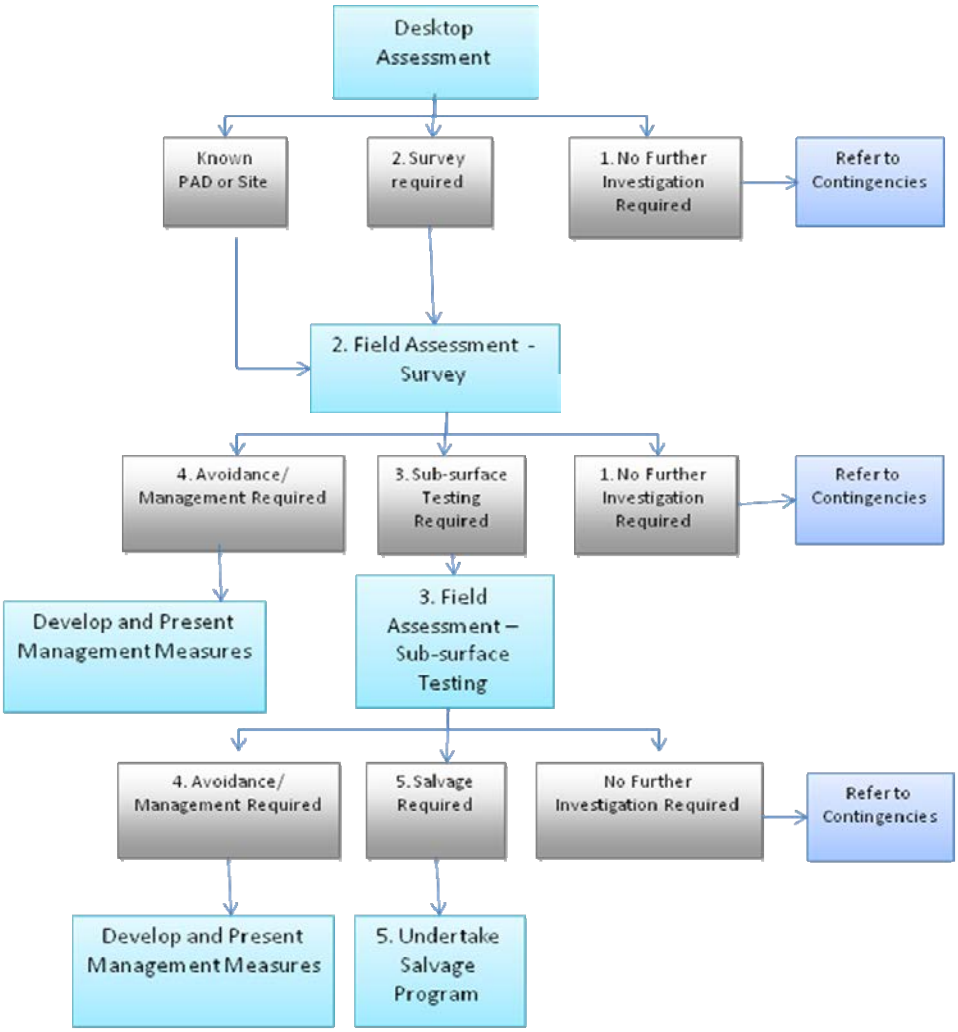


Figure 6-1 Management process to apply to construction ancillary areas

The steps outlined in Figure 6-1 are dependent on what is found to be present/absent from the ancillary sites or any change in the proposed locations. All investigations whould be in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (OEH 2010), and have regard to the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010). Field investigations are occurring concurrently with the display of this EIS, with the results to be identified in the project submissions report.

1. No survey required

- Determined through the desktop assessment to being part of an area that has already been assessed or once survey and sub-surface testing it has been determined to not be a site.
- Refer to contingencies (Section 9.4) for measures to be undertaken in the case of the unexpected discovery of cultural material or human remains.

2. Survey required

- Survey would be undertaken at all ancillary works and design change areas identified during the desktop as requiring investigation. The triggers for this would be if there is a known PAD or site, or the area has not been subject to any previous field investigation.
- Survey would involve the nominated Aboriginal site officers identified for the area.
- Survey would be undertaken by two methods:
    - Visual inspection – which would not require the entire area to be walked over due to past ground disturbance (eg road cutting) or environmental constraint (eg swamp). This would only be considered adequate if the nominated Aboriginal site officers are in agreement with the approach.
    - Foot survey – this would be undertaken with evenly spaced transects.
- The survey would identify if there is a PAD, if there is an area that may require avoidance or management (such as a scarred tree) or if there is no further investigation required.
- The PAD would be registered in AHIMS and further investigation would be undertaken.

3. Sub-surface testing required

- Sub-surface testing would be undertaken at all ancillary works and design change areas identified during the survey as being a PAD and requiring excavation.
- The methodology would follow that utilised during the original investigations. Broadly it is as follows:
    - Excavation only within the ancillary works or design change area boundary.
    - Spacing of test pits 10 metres – 20 metres apart in transects or parallel transects to create a grid.
    - Excavation of a series of 0.5 metre x 0.5 metre test pits by hand tools (eg trowel and shovel).

- Excavation was undertaken in a controlled manner, with the first test pit for each area in 50 millimetre spits (depth units), and subsequent test pits in that area in 50 millimetre to 100 millimetre spits (depending on soil layers identified).
- Sieving of excavated sediment using approximately 5 millimetre aperture wire-mesh sieves.
- Excavation below archaeological deposits into sterile soils.
- Drawing of stratigraphic profiles, and taking of scaled photos of every test pit;
- Finishing excavation in an area when enough information has been recovered to adequately characterise the objects present with regard to their nature and significance.
- Backfill of all completed test pits.
- Completion of Aboriginal site impact recording forms (ASIRF) for all excavation areas and lodging of these with AHIMS (underway at present).

- Excavation may also include larger size test pits such a 1 metre x 1 metre or trenches using the same hand methods.
- Sub-surface testing would identify if there is a need for further investigation (salvage) or if there is no further investigation required.

4. Avoidance or management

- There may potentially be a need to avoid an area or incorporate a management strategy. For example, if a scarred tree is located.
- If a need is identified for avoidance or management of an area, the specific requirements would be discussed in consultation with an archaeologist, the registered Aboriginal parties and RMS.

5. Salvage

- Salvage recommendations would be developed for each site discovered prior to any field salvage investigations being undertaken.
- The specific requirements would be discussed in consultation with an archaeologist, the registered Aboriginal parties and RMS.
- Recommendations would involve both hand excavation and/or mechanical excavation with a mechanical sieve. The salvage recommendations provided for specific sites in this report (Table 9-2) would be used as a guide to develop the salvage framework.

6.3. Results of the archaeological assessment

A total of 10,007,415 square metres (1,000 hectares) was subject to survey within the project corridor between Wells Crossing and Iluka Road, totalling over 94 per cent of the project corridor. The remainder of the project corridor is not considered a risk for cultural heritage sites or places, due to previous significant impacts (primarily the current Pacific Highway), and so does not require

survey. It should be noted however, that some Aboriginal stakeholders consulted felt that despite previous impacts, these areas still retained cultural significance and potentially unidentified spiritual significance.

The survey yielded an effective coverage (accounting for visibility and proportion of the sub-surface exposed) of three per cent, and a total of 12 standalone PADs and three sites, which also contained PAD components, were identified. As all 15 of these locations within the project corridor between Wells Crossing and Iluka Road contained PAD, they all required further assessment to assess their extent, nature, and significance (Table 6-1). Of these 15 PADs, nine contained sub-surface Aboriginal deposits. . As a result of the sub-surface testing, the status of PADs was either revised to 'site', or 'not a site' if no material was uncovered during sub-surface testing; however, sites that had PAD components were still classified as sites, even if no cultural material was recorded from excavations, as the surface material recorded in the survey still maintained their status as sites.

The Aboriginal deposits (stone artefacts) were discovered from 399 shovel test pits (0.5 metres x 0.5 metres). The details of these findings can be found within Volume 2 (Appendix A), while the significance of these sites is presented in Chapter 7, below; a summary is provided in Table 6-1.

Table 6-1 Current status of areas or sites following survey and sub-surface testing in the project corridor between Wells Crossing and Iluka Road

Project section	Name (AHIMS ID)	Previous type(s)	Description	Updated name	Updated site type(s)
3	WX2I PAD 8 (09-4-0108)	PAD	Located to the northeast of the intersection of Avenue Road and Wants Lane, on a relatively flat area of elevated ground northeast of dilapidated cattle yards.	WX2I PAD 8	No material found from sub-surface testing within the boundary of the project - PAD (outside the boundary of the project)
3	WX2I PAD 7 (09-4-0107)	PAD	Located at the east end of Tallowwood Road and northeast of Tallwood Lane, on a spur and to the south of a tributary of Coldstream River. The PAD measures approximately 50 m x 25 m and is on a small spur located between two tributaries of the Coldstream River.	WX2I Site 7	Site – Artefact scatter
3	WX2I PAD 6 (09-4-0106)	PAD	Located at the east end of Tallwood Lane and measures approximately 75 m x 30 m on a slightly sloping area on the lower slopes of a small spur. The spur faces towards a tributary of the Coldstream River.	WX2I Site 6	Site – Isolated artefact
3	WX2I PAD 5 (09-4-0105)	PAD	Located northeast of Tallwood Lane and measures approximately 75 m x 30 m on the lower slopes of a small spur which faces a swampy area and the Coldstream River.	WX2I Site 5	Site – Isolated artefact
3	WX2I PAD 4 (09-4-0104)	PAD	Located east of Tucabia Road and measures approximately 50 m x 25 m. Located on the mid slopes of a small spur which faces a swampy area and the Coldstream River to the west.	WX2I Site 4	Site – Artefact scatter

Project section	Name (AHIMS ID)	Previous type(s)	Description	Updated name	Updated site type(s)
4	Tyndale 1 (09-4-0099)	Site - Isolated artefact and PAD	Located on slopes and crest of rise overlooking floodplain of Clarence River.	Tyndale 1	Site – Artefact scatter
4	Tyndale 2 PAD (13-1-0115)	PAD	Well defined silty sand palaeo-terrace overlooking swampy floodplain of Clarence River.	Tyndale 2 Site	Site – Artefact scatter
4	Shark Creek PAD 4 (13-4-0172)	PAD	Upper slopes and crest of sandstone ridge spur, overlooking Shark Creek.	Shark Creek PAD 4	No material found from sub-surface testing within the boundary of the project - PAD (outside the boundary of the project)
4	Shark Creek PAD 3 (13-4-0171)	PAD	Upper slopes and crest of sandstone ridge and spur above floodplain of Clarence River.	Shark Creek PAD 3	No material found from sub-surface testing within the boundary of the project - PAD (outside the boundary of the project)
4	PAD 14 (09-4-0098)	PAD	Top of ridgeline, overlooking floodplain of the Clarence River.	None	No material found from sub-surface testing – **no longer considered to be a PAD or site**
4	Shark Creek PAD 1 (13-4-0173)	PAD	Flat crest of gradually sloping ridge spur overlooking floodplain of Clarence River.	None	No material found from sub-surface testing – **no longer considered to be a PAD or site**
4	Shark Creek PAD 2 (13-4-0170)	PAD	Flat lower slopes of spur above swampy floodplain of Clarence River.	Shark Creek Site 2	Site – Artefact scatter

Project section	Name (AHIMS ID)	Previous type(s)	Description	Updated name	Updated site type(s)
4	Hirst 2 (13-1-0185)	Site - Isolated artefact and PAD	Spur overlooking the swampy floodplain of the Clarence River.	Hirst 2	Site – Isolated artefact
4	Hirst 1 (09-1-0206)	Site - Isolated artefact and PAD	Middle slopes of a ridge spur overlooking the swampy floodplain of the Clarence River.	Hirst 1	Site – Isolated artefact
4	PAD 15 (04-4-0130)	PAD	Foot slopes at the edge of expansive swamp on Clarence River floodplain.	None	No material found from sub-surface testing – **no longer considered to be a PAD or site**

Figure 6-2 Section 3 - Sites and Places near or within the project corridor

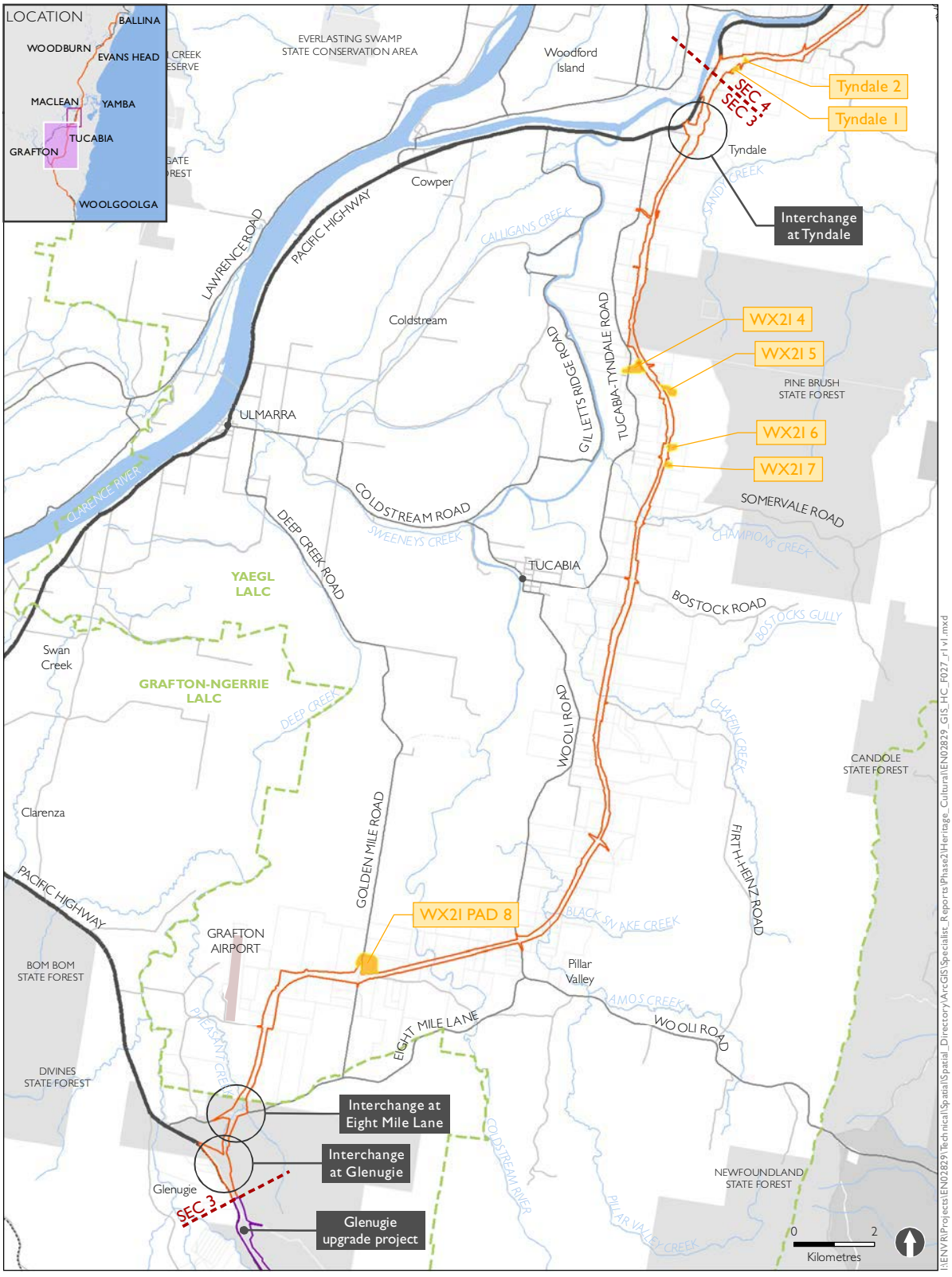
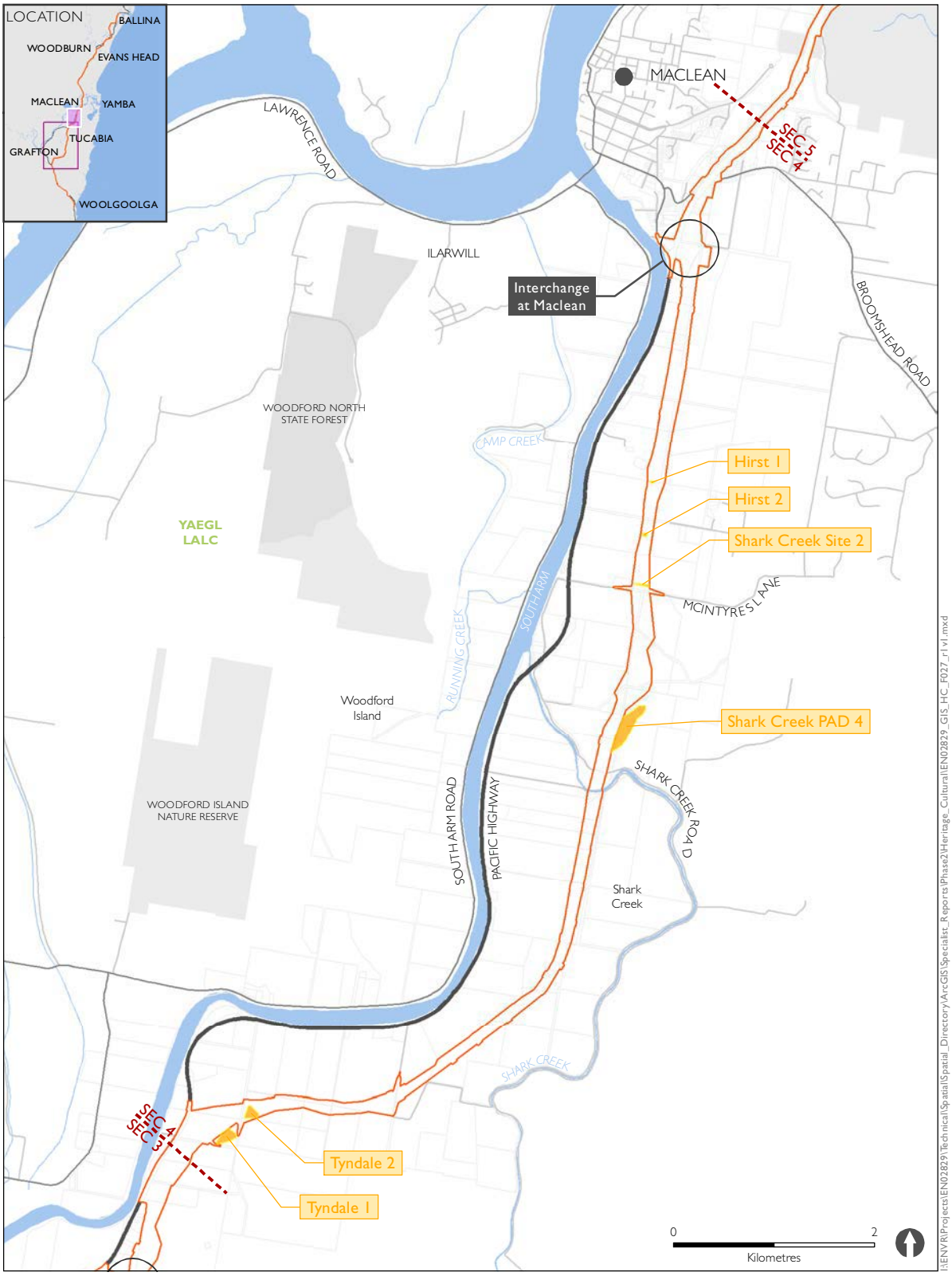


Figure 6-3 Section 4 - Sites and Places near or within the project corridor



7. Significance assessment

7.1. Methodology

7.1.1. Basis for assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. Evidently, this can be challenging as sites are important for different reasons to different people, and even at different times. The assessment of Aboriginal cultural heritage in this assessment is based upon the four values of the *Australia ICOMOS Burra Charter* (Australian ICOMOS 1999).

- Social values.
- Historical values.
- Scientific values.
- Aesthetic values.

Each of these values is assessed below, and an overall significance is then given based on an average across the values. This is inherently a reductive process, and oversimplifies what is important to a range of different stakeholders, but is a necessary process in being able to create comparative values between sites. The significance of each site ultimately feeds the management of sites and places (see Section 9).

7.1.2. Social significance

The significance of a site does not relate only to its scientific or research value. Aboriginal people's views on the significance of archaeological sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed from consultation with the nominated Aboriginal site officers and other members of the stakeholders, including Elders, both during and following field assessments. It should be noted that Aboriginal significance assessed in this manner may not reflect the views of all members of the community.

7.1.3. Scientific significance

Aboriginal site significance assessments need to consider both the scientific and social or cultural values of a site. Research potential or scientific significance of an Aboriginal archaeological site can be assessed by utilising the criteria set out below. Social or cultural values of a site can only be established through Aboriginal consultation.

Criteria used for assessing scientific significance for Aboriginal archaeological sites are described below. Ratings are low, moderate or high.

- **Site integrity –** The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through a number of factors among which are: natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals.
- **Site structure –** Structure refers to a site's physical dimensions, that is, size and stratification, or sub-surface deposits. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts.
- **Site contents –** This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied amount of organic and non organic materials are considered to have greater research potential than those sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. With scarred trees contents may refer to the size and type of scar or how many there are on the one tree.
- **Representativeness and rarity –** Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being undertaken. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (OEH 2011:10).

7.1.4. Aesthetic significance

This refers to the 'sensory' value of a place, and can include aspects such as form, texture, and colour, and can also include the smell and sound elements associated with use or experience of a site (Australian ICOMOS 1999). Aesthetic significance can be closely linked to the social value of a site.

7.1.5. Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

7.1.6. Scale of significance

Significance of sites and places is assigned to different geographic scales, such as local, regional, State and National, appropriate to the scale of importance. For example, Uluru is significant at a National (and World) scale, whereas a local historic building may only be significant on a local scale. This is reflected in the variety of heritage lists held by local councils, up to State and Federal government. In scale of significance, the criteria presented above as well as educational or research potential, representativeness and rarity (Australian ICOMOS 1999) have been considered in determinations of significance.

Each site has been assessed and its scale of significance has been identified as being of importance at the State, regional or local level. Each site has also been given a grading of its significance overall based on the grading of each of the individual values. The gradings of low, moderate and high have been assigned comparatively across the sites investigated in the region.

7.2. Statements of significance

7.2.1. Tyndale and Woodford Island corridors of movement

Social significance

- The place has high social significance as a result of its cultural importance. Although the exact location of this pathway is unknown, the linkages between Tyndale and Woodford Island are significant, and anecdotal information indicates that this pathway was important. There are Yaegl oral history accounts of an Aboriginal massacre site and an important traditional Aboriginal pathway, which crossed the south arm of the river and linked Tyndale with Woodford Island (Navin Officer 2009a: 23).

Historical significance

- The place has moderate historical significance as a potential massacre site is emblematic of the interactions between local Aboriginal people and European people on their arrival in the region in the 19th century. The site is important in demonstrating the prevalence of Aboriginal massacre sites across the region.
- This is believed to be in an area to the north of present-day Tyndale village, however, the exact location is not known.

Scientific significance

- The place does not meet this criterion.

Aesthetic significance

- The place does not meet this criterion.

Summary statement of significance

- Overall the place has moderate to high significance as a site reflective of the traditional corridors of movement for Aboriginal people in the region. The place is also significant as a reminder of the interactions between Aboriginal people and the Europeans in the early days of settlement. The site is important in demonstrating the prevalence of Aboriginal massacre sites across the Australian landscape.
- The difficulty with this place lies in the exact location and therefore protection or management of the site. Anecdotal information does not indicate a location for this place.

7.2.2. Pillar Valley men's and women's sites

Social significance

- These places have high social significance for their importance as cultural men's and women's sites in the Pillar Valley. The cultural connection and knowledge of these places is still strong and tangible within the community.
- The Garby Elders advised that the Pillar Valley (including the Pillar Rock and nearby waterholes) is a significant men's place (Navin Officer 2009a: 23). The Garby Elders also stated that the connection between the waterholes (near Pillar Rock) and Pillar Rock, in Pillar Valley, is important, and the whole area – and areas extending further east – are highly significant to the Garby Elders. There are also records of women's places occurring within the Pillar Valley.

Historical significance

- The place does not meet this criterion.

Scientific significance

- The place does not meet this criterion.

Aesthetic significance

- The place does not meet this criterion.

Summary statement of significance

- The significance of this place is social, and specifically cultural, as it bears witness to the ceremonial and sacred significance of the landscape in the daily lives of Aboriginal communities in this area.

7.2.3. Pillar Valley corridors of movement

Social significance

- This place has moderate social significance as it represents known examples of travel routes through the landscape used by Aboriginal people prior to and after European settlement. Traditional travel routes leading from Pillar Mountain to the Bull Paddock traverse the project corridor at Wells Crossing and another near to the north (Kuskie 2008).
- The Garby Elders also identified the Coldstream River as an important corridor linking significant areas at Glenugie, Pillar Valley and Tyndale (Navin Office 2009a: 23).
- Walking pathways linked the local Aboriginal groups along the North Coast and into the hinterland (DECC, 2009).

Historical significance

- The place has moderate historical significance as in the historical period camp sites were noted along these travel routes.

Scientific significance

- The place does not meet this criterion.

Aesthetic significance

- The place does not meet this criterion.

Summary statement of significance

- This place has moderate social and historical significance. It has social significance as it represents known pathways of movement between important cultural and social places in the Pillar valley and the North Coast. It has historical significance as camp sites in the Pillar Valley were documented during the historical period.

7.2.4. Birrugan and Mindi spiritual sites

Social significance

- These places have a high social significance due to the cultural and spiritual associations of the spiritual beings Birrugan and Mindi in the local creation story. These creation beings fought near Tyndale on the South Arm of the Clarence River.

Historical significance

- The place does not meet this criterion.

Scientific significance

- The place does not meet this criterion.

Aesthetic significance

- The place does not meet this criterion.

Summary statement of significance

- These spiritual places have high social significance to the Aboriginal communities of North Coast NSW due to the spiritual and cultural importance of these creation stories.

7.2.5. WX2I Site 7 (AHIMS ID 09-4-0107)

Social significance

- The artefact scatter at WX2I Site 7 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 7 consists of an artefact scatter comprising two chert artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the middle and lower slopes of a sandy rise and subject to erosion processes and possibly land clearing in the past. The site has a low rating for structure as it consists of only two artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 7 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.6. WX2I Site 6 (AHIMS ID 09-2-0106)

Social significance

- The isolated artefact at WX2I Site 6 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 6 consists of a single, isolated quartz artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the middle slopes of a sandy rise and subject to erosion processes and possibly land clearing in the past. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 6 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.7. WX2I Site 5 (AHIMS ID 09-4-0105)

Social significance

- The isolated artefact at WX2I Site 5 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 5 consists of a single, isolated quartz artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.

- The site has a low ranking for integrity as it is located mid-slope near a rise, it is also near a service road and there is evidence of water erosion processes. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 5 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.8. WX2I Site 4 (AHIMS ID 09-4-0104)

Social significance

- The artefact scatter at WX2I Site 4 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 4 consists of a scatter of five artefacts comprising chalcedony, silcrete and quartzite. The site has low scientific significance as it is ranked as having low integrity, low contents, low structure and low representativeness/rarity.
- The site has a low ranking for integrity as it is located near a track on the top of a spur in an area subject to logging, land clearance and near residential properties. The site has a low rating for structure as it consists of only five artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 4 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.9. Tyndale 1 (AHIMS ID 09-4-0099)

Social significance

- The artefact scatter at Tyndale 1 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Tyndale 1 consists of an artefact scatter comprising two artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.

- The site has a low ranking for integrity as it is located on the mid-upper slope of a hill, in semi-closed forest with rocky exposures and sandy soils. Other ground disturbance is evident in the vicinity with, machinery sheds and driveway. The site has a low rating for structure as it consists of only two artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Tyndale 1 has low significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.10. Tyndale 2 (AHIMS ID 13-1-0115)

Social significance

- The artefact scatter at Tyndale 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Tyndale 2 consists of an artefact scatter comprising nine artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.

- The site has a low ranking for integrity as it is located on a landscape which is currently being actively farmed for sugar cane. The site has a low rating for structure as it consists of only nine artefacts, and there is little stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Tyndale 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.11. Shark Creek Site 2 (AHIMS ID 13-4-0170)

Social significance

- The artefact scatter at Shark Creek Site 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Shark Creek Site 2 consists of an artefact scatter comprising three artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.

- The site has a low ranking for integrity as it is located on the lower slopes of a spur, above a floodplain. The area has previously been cleared and is currently producing a sugar cane crop. The site has a low rating for structure as it consists of only three artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Shark Creek Site 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.12. Hirst 2 (AHIMS ID 13-1-0185)

Social significance

- The isolated artefact at Hirst 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Hirst 2 consists of a single, isolated chert artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the mid to lower slope on the south side of a spur, overlooking a floodplain and subject to erosion processes. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Hirst 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.2.13. Hirst 1 (AHIMS ID 09-1-0206)

Social significance

- The isolated artefact at Hirst 1 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Hirst 1 consists of a single, isolated river cobble artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located mid-slope, in an area where vegetation has previously been cleared. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Hirst 1 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

7.3. Summary

The significance assessment of Aboriginal cultural places is shown in Table 7-1, while the significance of archaeological sites is shown in Table 7-2. The scientific significance assessment is shown in Appendix A.

Table 7-1 Summary of significance of Aboriginal cultural significance of Aboriginal cultural places near or within the project corridor between Wells Crossing and Iluka Road

Project section	Place name	Social significance	Historic significance	Scientific significance	Aesthetic significance	Overall significance
3	Tyndale and Woodford Island Corridors of Movement	High	Moderate	n/a	n/a	Moderate-High
3	Pillar Valley men's and women's sites	High	n/a	n/a	n/a	High
3	Pillar Valley corridors of movement	Moderate	Moderate	n/a	n/a	Moderate

Project section	Place name	Social significance	Historic significance	Scientific significance	Aesthetic significance	Overall significance
2, 5, 10	Birrugan and Mindi spiritual sites	High	n/a	n/a	n/a	High

Table 7-2 Summary of significance assessment of archaeological sites near or within the project corridor between Wells Crossing and Iluka Road

AHIMS ID	Name	Scientific significance	Cultural significance	Aesthetic significance	Historical significance	Overall significance
09-4-0107	WX2I Site 7	Low	Low	n/a	n/a	Low
09-4-0106	WX2I Site 6	Low	Low	n/a	n/a	Low
09-4-0105	WX2I Site 5	Low	Low	n/a	n/a	Low
09-4-0104	WX2I Site 4	Low	Low	n/a	n/a	Low
09-4-0099	Tyndale 1	Low	Low	n/a	n/a	Low
13-4-0115	Tyndale 2	Low	Low	n/a	n/a	Low
13-4-0170	Shark Creek Site 2	Low	Low	n/a	n/a	Low
13-1-0185	Hirst 2	Low	Low	n/a	n/a	Low
09-1-0206	Hirst 1	Low	Low	n/a	n/a	Low

Table 7-3 Summary of scientific significance assessment of archaeological sites near or within the project corridor between Wells Crossing and Iluka Road

AHIMS ID	Name	Site type	Integrity	Structure	Contents	Represent-ativeness / Rarity	Scientific significance
09-4-0107	WX2I Site 7	Low	Low	Low	Low	Low	Low
09-4-0106	WX2I Site 6	Low	Low	Low	Low	Low	Low
09-4-0105	WX2I Site 5	Low	Low	Low	Low	Low	Low
09-4-0104	WX2I Site 4	Low	Low	Low	Low	Low	Low
09-4-0099	Tyndale 1	Low	Low	Low	Low	Low	Low
13-4-0115	Tyndale 2	Low	Low	Low	Low	Low	Low
13-4-0170	Shark Creek Site 2	Low	Low	Low	Low	Low	Low
13-1-0185	Hirst 2	Low	Low	Low	Low	Low	Low
09-1-0206	Hirst 1	Low	Low	Low	Low	Low	Low

8. Impact assessment

The potential impact to Aboriginal cultural places and archaeological sites recorded within or near the project corridor has been considered. This section looks specifically at those areas where:

- Avoidance of a site or place will occur due to changes to the project corridor, and site may fall partially or wholly outside the project corridor, or some portion may remain within the project corridor but be avoided by construction.
- A site or place may not be directly impacted by construction of the project, but may be at risk of indirect impacts, such as a culturally sensitive place becoming more visible/accessible due to the construction of the project.
- Partial impact to a site or place would occur, with avoidance to part of the site within and/or outside of the project corridor.
- Impact is unavoidable and the site will be totally destroyed.

8.1. Impact avoidance

All recorded Aboriginal cultural places and archaeological sites recorded within or near to the project corridor have been considered in relation to the proposed road construction, operation and associated activities.

During the development of the preferred route and development of the concept design, the alignment was modified where possible to avoid or limit the impact to identified Aboriginal cultural values, particularly those of high significance. Examples of project refinements made to avoid Aboriginal cultural sites and archaeological sites include:

- The project corridor was realigned to avoid impact to a culturally sensitive area at Tyndale.
- Geotechnical investigations in the Shark Creek alternative alignment were adjusted following the field survey to ensure that investigations would not impact on archaeological sites or PADs.
- The project corridor was considerably re-aligned to avoid significant Pillar Valley men's and women's sites.

Despite the refinements described above, some impacts would still occur at a number of identified sites and places. The majority of impacts to Aboriginal cultural and archaeological sites along the project corridor would be likely to occur during the construction phase of the project. The types of impact which would occur include:

- Direct and indirect impacts from permanent infrastructure construction.
- Direct and indirect impacts from construction of temporary sites ancillary to the main road formation (eg construction compounds, batching plants or bulk materials storage).
- Indirect impacts during operation (such as water run-off, visibility, etc)

These impacts to Aboriginal heritage from the project (either permanent or temporary) are attributed to cultural places, archaeological sites and can be site specific or apply on a regional scale.

8.2. Impacts

8.2.1. Impacts to cultural places

Of the four Aboriginal cultural places within or near to the project corridor that may be impacted directly or indirectly, two cultural places were avoided through appropriate route option choice and project corridor refinements made during previous development project phases.

Two Aboriginal cultural places are within the project corridor and may be impacted by the project (see Table 8-1); no indirect impacts to places outside the project corridor are likely. Of these places:

- Pillar Valley corridors of movement comprises a whole landscape and would be partially impacted by the project.
- It is uncertain whether the Tyndale and Woodford Island corridors of movement would be impacted, as there is insufficient information to define its location(s) and extent(s), as the information appears to have been lost. As the project corridor passes between Woodford Island and Tyndale, impact to this place is likely.

Table 8-1 Impact to Aboriginal cultural places near or within the boundary of the project

Project section	Place name	Aboriginal significance	Impact	Description of impact
2, 5, 10	Birrugan and Mindi spiritual sites	High	None	No direct or indirect impact to the cultural heritage values of this place is likely from the project.
3	Tyndale and Woodford Island corridors of movement	Moderate	Direct	Will be partially impacted by excavation for construction of the road; the cultural heritage values and significance of this place will be diminished by the impact. However, the route of this corridor of movement is not known, as this information appears to have been lost.
3	Pillar Valley men's and women's sites	High	None	No direct or indirect impact to the cultural heritage values of this place is likely from the project – corridor moved to avoid.
3	Pillar Valley corridors of movement	Moderate	Direct	Partial impact – unavoidable as landscape covers region. Construction of the road across this corridor would result in irreversible impact to the cultural heritage values.

8.2.2. Impacts to archaeological sites

Of the nine archaeological sites near or within the project corridor between Wells Crossing and Iluka Road, four would be impacted directly and destroyed, four would be directly impacted to a

small degree (less than 10 per cent), and one is within the project corridor, but would be avoided by the project (Table 8-2). The overall significance of each of the archaeological sites is low. Based on the impact and significance of these sites, avoidance is not justifiable.

Table 8-2 Impacts to archaeological sites within and/or immediately adjacent to project corridor

AHIMS ID	Updated name	Overall significance	New site type(s)	Impact	Description
09-4-0107	WX2I Site 7	Low	Site – Artefact scatter	Direct	Only approximately 5 per cent of WX2I Site 7 is likely to be subject to excavation to provide construction of road cutting for approximately 30 m in length. The result would be the removal of approximately 5 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.
09-4-0106	WX2I Site 6	Low	Site – Isolated artefact	Direct	Only approximately 10 per cent of WX2I Site 6 is likely to be subject to excavation to provide construction of road cutting for approximately 60 m in length. The result would be the removal of approximately 10 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.
09-4-0105	WX2I Site 5	Low	Site – Isolated artefact	Direct	Only approximately 5 per cent of WX2I Site 5 is likely to be subject to excavation to provide construction of road cutting for approximately 60 m in length. The result would be the removal of approximately 5 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.
09-4-0104	WX2I Site 4	Low	Site – Artefact scatter	Direct	Only approximately 10 per cent of WX2I Site 4 is likely to be subject to excavation to provide construction of road for approximately 60 m in length. The result would be the removal of approximately 10 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the west.

AHIMS ID	Updated name	Overall significance	New site type(s)	Impact	Description
09-4-0099	Tyndale 1	Low	Site – Artefact scatter	Avoid	A very small part is within the project corridor, but avoided by the construction footprint. No indirect impact is likely. Part of the site will be avoided and is outside the boundary of the project to the south west. Fencing may be required to ensure impact from associated activities is avoided.
13-1-0115	Tyndale 2 Site	Low	Site – Artefact scatter	Direct	Tyndale 2 Site will be subject to excavation to provide construction of embanked road and culvert for approximately 170 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
13-4-0170	Shark Creek Site 2	Low	Site – Artefact scatter	Direct	Shark Creek Site 2 will be subject to excavation to provide construction of embanked road for approximately 25 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
13-1-0185	Hirst 2	Low	Site – Artefact Scatter	Direct	Hirst 2 will be subject to excavation to provide construction of road cutting for approximately 45 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
09-1-0206	Hirst 1	Low	Site – Isolated artefact	Direct	Hirst 1 will be subject to excavation to provide construction of road cutting for approximately 25 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.

8.3. Cumulative impact

8.3.1. Introduction

Cumulative impacts can be defined as the combined effects of environmental or social impacts that occur because of multiple activities and developments with similar impacts within a particular local area and region. Cumulative impacts can be measured generally overtime, or within discrete periods, such as the cumulative impacts of a project, or the cumulative impacts of European land-use activities.

A process for the assessment of cumulative impact has not been defined or endorsed by the NSW Government. Therefore, a range of approaches have been used in the past and the scope and complexity of these assessments have generally related to the scale of the proposal, the predicted interactions and the nature of the available comparative and baseline data.

The assessment of cumulative impacts on cultural heritage values must take into account the fact that many cultural values are a non-renewable resource, associated with a finite and limited number of surviving places and objects. Except for those cultural traditions which revive or

reinterpret past belief within new material forms, cultural heritage is mainly invested in the material evidence of the past. As such there is little ability to revive or re-establish the material past. It follows that each incremental loss of the material record of the past is irreversible, and itself a factor in changing perceptions of rarity and value.

Ideally an assessment of cumulative impacts should be measured against a baseline of data which characterises the existing cultural resources to be impacted, and the cumulative loss already realised. In the case of the local and regional contexts of the proposed project, effective data sets of such cultural heritage information do not exist. The OEH AHIMS database provides a register of known Aboriginal places in NSW, but is limited in its application due to the multiple and selective factors which affect the registration of recordings. Only a very small proportion of NSW has been the subject of comprehensive archaeological survey, and consequently, most patterns or trends evident within AHIMS site distributions reflect variables in data collection rather than the actual surviving resource. For example, following cultural heritage investigation for this project, the AHIMS register would show a relatively large concentration of sites in and around the project corridor compared to the surrounding region. This merely reflects the large scale of investigation undertaken for the project, rather than the actual distribution of sites. The gaps in archaeological survey across the project corridor region mean that the AHIMS register does not provide a complete baseline for a comprehensive cumulative impact assessment. However as the only baseline data available it does help inform qualitative observations and discussion on the cumulative impact.

8.3.2. Assessment

In considering the regional scale cumulative impact of the project, archaeological values across a range of site types and landforms must be assessed. Sites (type, density, integrity) do not exist in isolation. They are associated with particular landforms and natural features. Considering the combinations of these sites and features in an area assists in drawing conclusions about cumulative impacts. For example, a single site assessment identifying a number of artefact scatters associated with a scarred tree may find this site type common and typical. However, this site type may not exist with a similar association anywhere else in the region. As a result, this site and its context have significance at a regional level. Further it would pose a cumulative impact if it were to be impacted.

Approximately 15 per cent of the project corridor has been extensively impacted by previous earthmoving works and construction (predominantly the current and previous alignments of the Pacific Highway), such that there is no potential for Aboriginal heritage evidence to survive in those portions of the project corridor. It should be noted however, that Aboriginal stakeholders consulted felt that despite previous impacts, these areas still retained cultural significance and potentially unidentified spiritual significance. Outside these areas, activities such as logging over long periods, have disturbed much of the project corridor so that many non-robust archaeological site types, such as scarred trees, bora rings, shell deposit and burials have been destroyed, and more robust site types (such as artefact sites) have lost much of their integrity. Modelling on the OEH website (http://www.environment.nsw.gov.au/licences/AboriginalSitesDecisionSupportTool.htm) supports this theory with significant reductions in predicted distributions of scarred trees, shell deposit and burials between 1750 and the current model. This phenomenon has the effect of making these site types more significant due to their increased rarity and they thus need consideration of conservation and protection. Conversely, because of this disturbance, the potential impact of the Pacific Highway Upgrade to Aboriginal heritage is smaller, as most of the project corridor has already been at least moderately disturbed.

Within and near the project corridor there are four cultural places identified (Table 5-2). Two of these, both corridors of movement, will be impacted by the project. As these are landscape-scale

places, they are very difficult to avoid. Some impact to the values of these two places would occur, though registered Aboriginal parties seemed comfortable that investigation to date would mitigate any impact.

Based on the project corridor, nine archaeological sites are within 200 metres of the project corridor (none of which were known of prior to the project investigations) four of which would be destroyed, 4 of which would be impacted only to a small degree (less than 10 per cent) and one of which is within the project corridor, but would be avoided by the project. The overall significance of each of the archaeological sites is low. The regional Aboriginal cultural heritage values across the project corridor region would be minimally reduced by the cumulative impacts from the project. Efforts were made by the RMS throughout the different project stages to date to avoid impact to more significant Aboriginal cultural places and archaeological sites, such as burials, carved trees and ceremonial sites, thus leading to such a low cumulative impact to the Aboriginal cultural values of the region. The data gathered during this investigation and the data to be gathered as part of the impact mitigation (particularly salvage) recommended in Chapter 9 are considered sufficient to mitigate and off-set the cumulative regional impacts of the project.

In summary, an accurate cumulative impact assessment of the project is hindered due to the lack of a comparative dataset. However, given the relatively low number of sites and places directly impacted by the conduct of the activity, and the knowledge gained through consultation and investigation, it may be observed that the regional archaeological resource would not be impacted to a significant level because of this project. On a regional scale, loss of archaeological resources due to the project is considered low, especially considering the scale of the project.

As further sites are recorded in the conduct of future heritage investigations, a more complete picture of the area is created. It is noted that artefact scatters are mainly associated with elevated and well-drained areas, regularly overlooking water bodies. If a broader area is considered, similar landforms in an undisturbed context exist extensively in the north coast region, thus these site types will remain with more integrity outside the project corridor.

8.3.3. Assay of the Pacific Highway upgrade program

Within an assessment of cumulative impact, project specific cumulative impacts must be considered. In this case, consideration of the cumulative impact of the project in the context of the entire Pacific Highway upgrade project is appropriate. The planned and partly realised upgrade of the Pacific Highway aims to construct a continuous four lane divided dual carriageway, between Hexham and the NSW-Queensland border, a distance of approximately 680 kilometres.

An exhaustive cumulative assessment of the cultural heritage impacts of all portions of the Pacific Highway upgrade is beyond the scope of the present investigation. However it can be noted that the majority of the archaeological sites are common (e.g. small flaked-stone artefact scatters) within the region the Pacific Highway passes through, with few exceptional raw materials or artefact types. Many of these site types and associated landforms still exist un-impacted (and likely unrecorded) within the region. This notion is also supported by the large number of landform based PADs located within the Pacific Highway corridor that also extend outside the Pacific Highway corridor.

Additionally, it should be noted that the Pacific Highway upgrade project investigations often form the largest investigations in the regions that they traverse, and so add greatly to the understanding of archaeology and Aboriginal occupation in the regions, and in this way contribute a positive legacy for these regions. However, the permanency of the Pacific Highway Upgrade projects is contrasted with the less stable nature of heritage and will unfortunately and inevitably lead to some loss of the cultural heritage values of the region.

9. Management recommendations

To manage impacts to Aboriginal archaeological and cultural heritage the broad objectives for the project are:

- Avoid or minimise impacts on significant cultural heritage.
- Preserve as much cultural heritage in its original environment as possible.
- Maintain cultural heritage through preservation, salvage and increased knowledge.

The first principle of cultural heritage management is impact avoidance and minimisation before mitigation. If it is not possible to completely avoid sites, then mitigation is required for parts of sites that are not going to be impacted. Where complete avoidance is not possible, management recommendations must be implemented for impacted areas of each of the archaeological sites. These recommendations have been developed to aim to avoid significant impacts and where impacts are unavoidable, to effectively mitigate impacts. Management recommendations have been drafted in accordance with the amount of impact to the site and the significance of the site. All management recommendations have been presented to relevant registered Aboriginal parties, and their comments have been considered and where possible, incorporated into the recommendations.

A summary of the management recommendations for archaeological sites is displayed in

Table 9-1. Detailed recommendations for Aboriginal cultural places are discussed in Section 9.3.2.Detailed management recommendations for archaeological sites are included in Table 9-2. Where there is unexpected discovery of Aboriginal objects within the project corridor, refer to Section 9.4 for contingency actions that would be followed.

It must be noted that many of the registered Aboriginal parties have recommended that monitoring of, or inspections following vegetation clearance or groundbreaking works be undertaken by their site officers in an effort to identify and collect any artefacts uncovered during works. However, this mitigation strategy is only endorsed by the RMS PACHCI guidelines and OEH policies where there is a significant risk that Aboriginal objects are likely to be uncovered by activities. There is not a significant risk that Aboriginal objects are likely to be uncovered by the project, and so monitoring cannot be recommended in this CHAR. As mentioned above, unexpected finds contingencies must be followed should any Aboriginal heritage material be discovered (Section 9.4). Additionally, cultural heritage awareness training must be undertaken for all personnel involved in the construction of the project to aid in the identification of Aboriginal cultural heritage material (see Section 9.1 below).

Table 9-1 Summary of management recommendations of archaeological sites near or within the project corridor

Management recommendations	Number of sites	Name of site
Collection and salvage excavations (mechanical). Detailed analysis and reporting of cultural material. Dating of cultural material where applicable.	1	Tyndale 2 Site
Collection of artefacts. Detailed analysis and reporting of cultural material. No salvage excavation required.	7	WX2I Site 7 WX2I Site 6 WX2I Site 5 WX2I Site 4 Shark Creek Site 2 Hirst 1 Hirst 2
An exclusion zone should be put in place to ensure incidental damage does not occur to these archaeological deposits.	1	Tyndale 1

9.1. General project management requirements

The following requirements would apply throughout construction to the management of all Aboriginal heritage sites and places within the project corridor:

- Try to further minimise impacts on sites during detailed project design.
- All salvage excavations would be restricted to the site extent within the boundary of the project, and should be undertaken with regard to the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010).
- All field-based mitigation (eg collection, salvage) must be undertaken with relevant Aboriginal site officers.
- Project updates would be distributed to registered Aboriginal stakeholders at least every 3 months, and AFG meetings should be held with registered Aboriginal stakeholders minimally every 6 months prior to and during construction, until management actions have been completed.
- The results of the salvage excavations and the archaeological material analysis would be included within a detailed salvage report.
- Additionally, a summary report (to be made public) will accompany the technical report.
- In acknowledgement of Aboriginal people's connection to and millennia of continued use of the land and its natural resources, registered Aboriginal stakeholders should be provided with the reasonable opportunity to have access to some of the natural resources within the boundary of

the project to maintain and develop their cultural traditions. This could include a selection of trees, or other plants. These trees or other resources should be identified in pre-construction prior to vegetation clearance.

- Cultural heritage awareness training must be undertaken for all personnel prior to involvement in the construction of the project. Where possible, this should be undertaken externally, and the possibility of a local Aboriginal organisation providing this service should be explored.
- Compliance auditing of the project for cultural heritage purposes should occur every 3 months during pre-construction and construction – any non-complying impact to Aboriginal heritage sites should be reported to the registered Aboriginal stakeholders, and resolved jointly between RMS and the registered Aboriginal stakeholders.
- An Aboriginal heritage interpretation strategy would be prepared as part of the Aboriginal heritage management plan. This will identify how archaeological and cultural information can be sustainably communicated to different audiences, including the local Aboriginal community, the local general public and the broader group of people interested in Aboriginal heritage as part of the North Coast's history. Measures would include opportunities for promoting salvage and investigation, the recovery of information, permanent installations and ways of marking the presence of Aboriginal people in the landscape, including, signage, enduring interpretation products such as books and through place naming.

9.2. Effectiveness of mitigation

The implementation of the management recommendations described below will be effective in avoiding impact and where avoidance is not possible, these recommendations will be effective in mitigating the impact to sites and places.

To ensure the effectiveness of the mitigation proposed and to be adaptable to any finds during the salvage that are significantly different to those in this CHAR, the salvage excavation methodology and quotas proposed in Table 9-2 must be reviewed while the salvage is underway, by at least the time 50 per cent of the quota has been reached. This should involve a discussion with the contracted archaeologist, and relevant registered Aboriginal parties. Any increase or decrease to the quota, or change of methodology proposed must be approved by the RMS Senior Environmental Environment Specialist Heritage, or the OEH. If no change to the quota is proposed, then the salvage may be completed. At any time (including after the review mentioned above), if significantly different findings are made, the quotas/methodology should be reviewed as mentioned above.

The management recommendations below have been based on the significance assessment and the current expected impact to sites and places (as described in Chapter 8 and further quantified in Table 9-2). Should impacts to sites within the boundary of the project change by more than 10 per cent, these management recommendations should be reviewed, as they may need to be adjusted according to the nature of the increase or reduction of impact. For example, an increase or decrease in impact to a site may warrant a more or less of the site to be salvaged, or may warrant the nature of the mitigation to be altered more significantly. The appropriateness of changes to salvage quotas or management recommendations would be done on a site-by-site basis, take account of the specific changes to the impact, and would be done in consultation with registered Aboriginal parties.

Any impact proposed beyond the boundary of the project as assessed in this report must be subject to assessment and consultation with registered Aboriginal parties, consistent with the process in this report.

9.3. Specific management requirements

9.3.1. Archaeological sites

Each site to be impacted by the construction works within the boundary of the project has specific management requirements (see Table 9-2), and specific management requirements have been included for site protection and avoidance. Broadly these fit into three categories:

- Collection of cultural material located during the survey and sub-surface testing program – only excavation required to recover already discovered sub-surface material would be undertaken – no new excavation would be undertaken.
- Salvage excavation – mechanical and/or hand excavation to salvage the archaeology associated with these sites – this would be located in parts of the site not previously subject to sub-surface testing, but should generally be located in the vicinity of locations where features and/or higher concentrations have been recorded and outside areas of high disturbance.
- Fencing – 'No Go' zones due to the location of a cultural heritage site/place.

For all salvaged material, suitable storage must be agreed upon with the registered Aboriginal parties prior to commencing salvage in those areas. If it is determined that the objects will be removed from the project area to be transferred to a separate safe storage location (temporarily or permanently), the curator of these objects will be required to ensure they comply with Section 85A of the NPW Act. This will involve the submission to OEH of a Care Agreement application which must also include an accurate catalogue of any objects collected/transferred

Where artefact concentrations per square metre (over all depths) encountered are 50 per cent greater than previously encountered, additional hand-tool salvage excavation must be undertaken. If these artefact concentrations are encountered during machine excavation, then machine excavation must stop within 20 metres, and hand-tool excavation must proceed to define the extent of the concentration within the project corridor. Other features that must trigger such additional salvage excavation include, encountering:

- *In situ* lithic flaking floors.
- Remains of a hearth in relatively *in situ* condition.
- *In situ* non-human bone relating to Aboriginal occupation.
- Midden deposit.

Up to but no more than an additional six square metres must be excavated in this situation at that site, unless rare features are encountered, in which case discussions with the registered Aboriginal parties and OEH should be undertaken to agree on a suitable approach.

Table 9-2 Management requirements for archaeological sites within the project corridor between Wells Crossing and Iluka Road

Project section	Name (AHIMS ID)	Site type	Overall Significance	Impact	Mitigation strategy/ recommendations
3	09-4-0107 WX2I Site 7	Artefact scatter	Low	5%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0106 WX2I Site 6	Artefact scatter	Low	10%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0105 WX2I Site 5	Artefact scatter	Low	5%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0104 WX2I Site 4	Artefact scatter	Low	10%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing)..
4	09-4-0099 Tyndale 1	Artefact scatter	Low	0%	**All of this site will be avoided by the project**; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).

Project section	Name (AHIMS ID)	Site type	Overall Significance	Impact	Mitigation strategy/ recommendations
4	13-1-0115 Tyndale 2 Site	Artefact scatter	Low	100%	Salvage excavation must be undertaken of this site within the site extent and within the project corridor. A total of 20 m² to be excavated by machine. This would be undertaken with a mechanical sieve and an excavator (900 mm or 1100 mm bucket). Each excavation must be undertaken in 50 mm spits to sterile base deposits. The location of excavations should be decided upon in the field by the archaeologist and Traditional Owners. All artefacts which have previously been recorded and reburied during sub-surface testing must be recovered. All cultural material recovered during salvage would be removed off-site for detailed analysis to be undertaken. Once analysed the material would be returned to the Traditional Owners for reburial or storage at a chosen location. Details of the materials nature and context should also be provided. Cultural material recovered would be subject to detailed analysis and inclusion in a technical report.
4	13-4-0170 Shark Creek Site 2	Artefact scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.
4	13-1-0185 Hirst 2	Artefact Scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.
4	09-1-0206 Hirst 1	Artefact scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.

9.3.2. Aboriginal cultural places

Each Aboriginal cultural place identified within the project corridor requires management or mitigation. The management requirements for cultural places are listed in Table 9-3. The cultural places impacted cover a broad area of land so specific management measures are not possible. In these cases other types of management is appropriate, including:

- Enabling access to the areas for the Traditional Owners.
- Cultural heritage awareness workshops prior to construction.
- Educational and cultural signage at rest areas.

Table 9-3 Management requirements for Aboriginal cultural places near or within the project corridor between Wells Crossing and Iluka Road

Project section	Place name	Aboriginal significance	Impact	Mitigation strategy/recommendations
2, 5, 10	Birrugan and Mindi spiritual sites	High	None	None required
3	Tyndale and Woodford Island corridors of movement	Moderate	Partial impact - unavoidable as traverses region	Access across the project should be considered in detailed design to maintain the connectivity of this corridor of movement.
3	Pillar Valley men's and women's sites	High	None	None required
3	Pillar Valley corridors of movement	Moderate	Partial impact - unavoidable as traverses region	Access across the project should be considered in detailed design to maintain the connectivity of this corridor of movement.

9.3.3. Ancillary areas

All areas proposed to be used for ancillary works that are likely to contain Aboriginal objects, would be subject to further archaeological investigation. This would include archaeological field survey, and if required, archaeological test excavations.

The results of these investigations would be presented in a separate archaeological report, and if required, an addendum to this CHAR.

9.4. Management procedures

9.4.1. Unexpected discovery of archaeological finds

The below procedure is consistent with RMS Unexpected Archaeological Finds Procedure (RMS 2011c), but summarises several details – the full document should be consulted in the instance of an unexpected find; this can be found at http://www.rta.nsw.gov.au/environment/downloads/unexpected_archaeological_finds_procedure.pdf, or by contacting an RMS regional environment staff.

If Aboriginal cultural heritage is found during construction activities, the following steps would be followed:

- Stop work in the immediate area (within approximately 25 metres) of the find and notify the project manager.
- The project manager should arrange for a number of photographs that capture the general context and specific details of the find to be taken, and where practical delineate and protect the find with appropriate high-visibility fencing – no further interference must occur with the find or within the protected area. Only construction that is required to comply with occupational and environmental health and safety standards and/or to protect the cultural heritage would occur. Inform all site personnel of this protected area.
- The project manager should inform the relevant RMS regional environment staff, Senior Environmental Specialist (Heritage), and the Aboriginal Cultural Heritage Advisor (Northern Region).
- If the find is reasonably suspected to be human remains, proceed directly to notifying local police.
- A suitably qualified and experienced archaeologist should be engaged to inspect the find, conduct a preliminary assessment and prepare an archaeological management plan.
- The Aboriginal Cultural Heritage Advisor (Northern Region), or the archaeologist will also make contact with the registered Aboriginal parties and invite them to take part in the site inspection and assessment of the finds, as well as taking part in preparing any management strategies and plans for any objects discovered.
- Subject to the archaeologist's assessment, work can recommence at a set distance from the find, determined by the archaeologist. This is to protect any other archaeological material that may exist in the vicinity, which has not yet been uncovered – existing protective fencing may need to be adjusted to reflect the newly assessed protected area. No works are to take place within this area until further written notice from the archaeologist/project manager.
- The archaeologist must prepare and archaeological management plan in accordance with the RMS Unexpected Archaeological Finds Procedure (RMS 2011c) shortly after the site inspection.

- In preparing the management plan, the archaeologist with the assistance of RMS regional environment staff must review the Construction Environmental Management Plan, any heritage sub-plans, any conditions of project approval and heritage assessment documentation (eg this report). Discussions should occur with design engineers to consider if re-design options exist and are appropriate.
- The management plan must be submitted to the project manager as a letter, brief report, or email within two working days.
- In accordance with the RMS's Unexpected Archaeological Finds Procedure (RMS 2011c), notify OEH to inform them of any find (eg submit an AHIMS site card), including the archaeological management plan.

- Reviews of the archaeological management plan and notification must occur in accordance with RMS Unexpected Archaeological Finds Procedure (RMS 2011c).
- Assess whether heritage impact is consistent with the project approval or if project approval modification is required from the Department of Planning and Infrastructure.
- Implement the archaeological management plan.
- Ensure all archaeological work has been completed prior to RMS project work resuming – written clearance to resume work from the archaeologist, RMS regional environment staff, and if necessary OEH.

9.4.2. Notification and reporting of incidents that breach this management plan

- Incident reporting requirements in accordance with Project Approval would include Aboriginal heritage.
- Where the RMS reasonably suspects that an incident has occurred that contravenes the management plan presented here, the project incident management system will be followed.

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Appendix A Aboriginal Archaeological Assessment Report

1. Introduction

This archaeological assessment forms the second volume to the Aboriginal cultural heritage assessment report (CHAR) for the Wells Crossing to Iluka Road section of the Woolgoolga to Ballina Pacific Highway upgrade project (the 'project').

The purpose of this report is to present the process, results and discussion of the archaeological assessment undertaken as part of the CHAR between Wells Crossing and Iluka Road. The assessment has been undertaken with regard for the Department of Environment, Climate Change and Water (DECCW) Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010.

Project information, significance assessment, impact assessment and management recommendations are all contained within Volume 1 of this report. Additionally, a summary of information and results contained in this archaeological assessment are also included in Volume 1. As such, this report Volume 2, Appendix A, serves as a supplement to Volume 1 and the two documents should be read concurrently.

This archaeological assessment is structured as follows:

- Chapter 1: Introduction.
- Chapter 2: Desktop assessment – develops the background information further from that presented in Volume 1, including specific information on previous archaeological investigations and development of a predictive model that aims to identify landforms with sensitivity for Aboriginal cultural heritage sites.
- Chapter 3: Field survey – describes the methods and outcomes of the field survey conducted to identify Aboriginal cultural heritage sites and potential archaeological deposits (PADs).
- Chapter 4: Sub-surface testing – explains the approach taken, process and results of the sub-surface test excavation program undertaken to explore the presence, nature and extent of sub-surface archaeological deposits.
- Chapter 5: Archaeological sites – presents analysis and discussion on the sites within the project corridor between Wells Crossing to Iluka Road.
- Chapter 6: Significance assessment.
- Chapter 7: Impact assessment.
- Chapter 8: Management recommendations.

It should be noted that the consultation undertaken for this archaeological assessment (with regard for the Office of Environment and Heritage (OEH) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010) is described in Volume 1 (the CHAR).

2. Review of background information

2.1. Introduction

The region around the project corridor is poorly studied in regards to the archaeology of Aboriginal occupation. Previous archaeological investigation in the region has focussed more on the coast to the south or around Grafton and has generally been for transmission lines, and the occasional local council study, giving reasonable overviews of the area, but few more specific investigations.

The archaeological assessment methodology used the available information to develop a predictive model. This chapter specifically draws information from previous investigations that have been undertaken within the region of the project. The predictive model developed in section 2.1.1 draws on the information from previous investigations as well as the following sections from Volume 1:

- Historical context (Volume 1, Chapter 3).
- Existing environment (Volume 1, Chapter 4).
- Aboriginal cultural assessment (Volume 1, Chapter 5)
- Previously recorded cultural heritage sites (Volume 1, Chapter 6).

2.1.1. Previous investigations within the project corridor between Wells Crossing and Iluka Road

Navin Officer (2009a) conducted an Aboriginal heritage assessment for the proposed Pacific Highway upgrade for the section between Wells Crossing and Iluka Road, Woombah. A search of the Aboriginal heritage information management system (AHIMS) within a 62 kilometre by 22 kilometre area (including the project corridor) identified two previously recorded open camp sites (artefact scatters) within the vicinity of the project corridor. No Aboriginal sites were identified during the survey in their study area; however, eight PADs were recorded. In addition, several places of cultural significance were also identified.

Collins (2009) conducted an Aboriginal cultural heritage assessment of a proposed 66 kilovolt transmission line between the townships of Grafton and Maclean for Clarence Consultants Pty Ltd. Collins (2009) study area is either within or in close proximity to the project corridor. A total of two artefact scatters and a scarred tree were identified during the survey, however, these were located outside the project corridor.

Collins (2008) conducted an Aboriginal heritage assessment of the project corridor, between the townships of Woodburn and Iluka Road, Woombah. A total of five archaeological sites were identified within Collins' (2008) study area and comprise three isolated stone artefacts, a low-density stone artefact scatter and an engraved (scarred) tree. Furthermore, a previously registered burial (Sawpit Creek Burial, AHIMS ID 13-1-0059) was located just outside her study area. The isolated artefacts were identified on the crest of a ridgeline, the upper slope of a ridge and on a creek bank. The low density artefact scatter was identified on the upper slope and crest of an undulating ridgeline. The stone artefacts were manufactured from petrified wood, siltstone, chert, tuff, greywacke and chalcedony. No information regarding the landform associated with the scarred trees was provided.

In addition, several other archaeological investigations have been undertaken near the project corridor (see below). One rock shelter with art is within approximately one kilometre of the project corridor.

2.1.2. Previous Aboriginal archaeological investigations near the project corridor between Wells Crossing and Iluka Road

Byrne (1981) conducted a cultural heritage assessment of the proposed 330 kilovolt electricity line between Grafton and Lismore, for the Electricity Commission of NSW. Isolated stone artefacts were identified in two locations. The first artefact consists of an orange-brown quartzite flake embedded in a low bank at the edge of a recently cultivated paddock. The second artefact consists of a coarse grained silcrete core tool identified on sloping ground. A total of three stone artefact scatters were also identified during the survey and consists of chert, quartzite, quartz, silcrete artefacts identified on spurs, slopes and ridges.

Piper (1982) conducted a cultural heritage assessment of a proposed 66 kilovolt transmission line near Iluka for the Northern Rivers County Council. A total of two Aboriginal sites were identified during the survey and consist of an artefact scatter and shell midden. The artefact scatter consists of four chalcedony flakes scattered along the rim of a sand deflation along the edge of Iluka Road. The shell midden consists of exposed shell deposit eroding from a vegetated sand ridge between Iluka Road and the Clarence River.

Byrne (1985) produced a background report for the management of Aboriginal archaeological resources in the Ulmarra Shire Council. Byrne (1985) assessed the archaeological potential of the four landforms within the study area (floodplain, riverine, uplands and coast and coastal wetlands) and predicted the Aboriginal site types that would exist within these areas:

- Floodplain: Open sites consisting of stone artefact scatters will be the most common Aboriginal site type and will be located on high ground in and around the periphery of the floodplain. A previously recorded bora ground and burial site indicate that there is a likelihood of find other such sites in this region. Due to the depositional environment of the floodplain, most sites are likely to be covered to some extent by alluvium.
- Riverine: There is a clear association between Kangaroo Creek Sandstone and rockshelter occupation / art sites along the Orara River. Open campsites may also be identified along the length of the Orara especially on the flat tops of spurs running down to bends in the river. Stone arrangements and bora grounds may also exist along the length of the Orara. Site density will be lower along watercourses draining into or through the floodplain due to poor drainage conditions.

- The Uplands: Open camp sites may be identified on flat positions such as saddles and along the tops of ridges. Rockshelters may also be identified in the Kangaroo Creek Sandstone which occurs within the coastal ranges. Bora grounds and stone arrangements may also be found in the upland zone.
- Coast and Coastal Wetlands: Middens will be the most common site type and may be located between beaches and swamps in order to draw on the resources of both environments. Middens may also be identified west of backdunes on the margins of floodplain swamps, albeit on relatively high and well-drained surfaces. Stone artefact scatters may be identified in similar environments as shell middens as well as the ridges and spurs of dry schlerophyll country along the coast. Finally, small fish traps and burials may also occur within the region.

Navin and Officer (1990) conducted a cultural heritage assessment of a proposed 330 kilovolt transmission line between Coffs harbour and Koolkhan (north of Grafton) for the Electricity Commission of NSW. A total of 50 Aboriginal sites were identified as well as five PADs and six isolated finds. The Aboriginal sites consisted of 27 artefact scatters, three quarry sites, and three scarred trees. Aboriginal sites were identified in all landforms within their study area although predominantly in hilly, ridgeline country. Further north along Navin and Officer's (1990) proposed alignment, Aboriginal sites were identified in close proximity to creeks and alluvial flats, where creek valleys offered better travel routes than surrounding hillslopes.

Collins (1998b) conducted an Aboriginal cultural heritage assessment of the proposed Pacific Highway bypass at Ulmarra for the Roads and Traffic Authority (RTA) (now RMS). No Aboriginal cultural material was identified during the survey. A total of two greywacke edge-ground axes a sandstone hammerstone were identified by a landowner within Collins' (1998b) study area. Furthermore, a pebble axe find was also reported by a resident within Collins' (1998b) study area.

Table 2-1 Previous archaeological investigations in proximity to the project corridor

Reference	Aboriginal sites	Results / conclusions
McBryde 1974	Numerous	A range of Aboriginal sites were investigated, including middens, quarry sites and a series of rock shelters along the Clarence River and its tributaries.
Navin and Officer 1990	39 Artefact Scatters 4 Scarred Trees 4 Rock Shelters 3 Quarry Sites (Silcrete) 6 Isolated Finds	Fewer sites were identified on the lowland hills compared to the rangelands. The authors attributed this to the effects of European land-use and aggrading landforms. Furthermore, stream flats and elevated ground adjacent to wetlands or floodplains was considered the most archaeological sensitive locations with the exception of rock shelters.
Byrne 1986	0	The Shire of Maclean would have had a low-level use of the sub-coastal uplands by small mobile groups exploiting the relatively dispersed resources.
Appleton and Beck 1995	9	A total of 28 artefacts from nine locations were identified. Undertaken for the Corindi sewerage scheme directly to the west of Corindi, near Kangaroo trail road.

Reference	Aboriginal sites	Results / conclusions
Hill and Murphy 2000	1	Details the salvage of the Kangaroo Trail S4 site previously identified by Appleton and Beck 1995. Located on Kangaroo Trail Road. The result was a total of 208 artefacts (including indurated mudstone, chert, greywacke) with most recovered from the trail itself in areas of disturbance.
Smith 1998	1	A shell midden located at Arrawarra.

2.2. Predictive model for site type and distribution

It is commonly recognised that archaeological sites tend to occur in favourable environmental settings. Predictive models use these patterns to identify the environmental characteristics of places where sites are more likely to occur. Craib (1992: 10), states that;

> "The goal of predictive models is to correctly identify important aspects of the natural and/or social environment that influenced the location of human activities, and to interpret the archaeological record as the result of a set of functional, temporal, spatial and behavioural responses to a varied environment."

Providing the available data is reliable, it is possible to extrapolate from a relatively small sample of known locations and apply to a much broader but similar landscape area (Collins 2008).

The predictive model applied to this study was based on a 'land system' or 'archaeological landscape' model of site location. This enables the prediction of site location based on known patterns of site distribution in similar land systems or archaeological landscapes. To ensure that the predictive model was specific, the predictive model presented here was developed by defining further specific landscape characteristics, where possible, within each land system. High risk landforms that are likely to contain Aboriginal archaeological sites were then highlighted within each of these landscape characteristics. Each high risk landform was assigned an archaeological sensitivity rating based on:

- Ethnohistory and cultural knowledge (refer to Volume 1, Chapter 5).
- Previous impacts to the landform and the potential effects of these impacts on the archaeological record (refer to Volume 1, Chapter 4).
- Previous models developed for the project corridor and surrounds.
- Previous survey results in and adjacent to the project corridor.
- Distribution patterns of known sites and site types in each landform (as previously discussed above and in Volume 1, Chapter 6).

Archaeological sensitivities assigned to landforms were low (L), low-moderate (L-M), moderate (M), moderate-high (M-H) and high (H) based on previous findings and average levels of ground disturbance across the landforms. These sensitivities essentially reflect the degree of likelihood for particular site types to be found within them.

Table 2-2 shows the predictive model for Aboriginal archaeological sites within the project corridor. It should be noted that sensitivity ratings in Table 2-2 relate to the likelihood of finding Aboriginal archaeological sites, not necessarily the significance of any site found there. As there are few records of the sub-surface nature of archaeological sites across the project corridor, the predictive model is consequently skewed towards extrusive (surface) and shallow, eroding sites.

The location of archaeological sites within the landscape is not caused by pure environmental determinism. It is also important to note that cultural preferences may increase the likelihood of archaeological material or unidentified cultural places in or around the project corridor in areas not accounted for in the predictive model.

Recent geographic information system (GIS) predictive modelling undertaken by the OEH is also useful to review here. This model is based on the locations of sites registered on the AHIMS within specific landforms and accounts for the accumulated impact of post-1750 land use impacts (Appendix G)[1] on specific site types.

Appendix G includes a series of maps previously provided by OEH that show the results of this predictive modelling of the region around the project corridor for a range of site types (artefact sites, scarred trees, shell middens, and burials). Land impacts in the region are an important part of this modelling. For example, logging will have a significant impact on the distribution of scarred trees, but a more moderate impact on artefact scatters. This modelling is useful as a supplementary overview of the project corridor and surrounding region, and generally accords with Table 2-2, however the model may not be sensitive enough to capture smaller scale variability. The predictive model presented in Table 2-2 is designed to account for this variability.

[1] For more information on the basis of this modelling, see http://www.environment.nsw.gov.au/licences/AboriginalSitesDecisionSupportTool.htm.

Table 2-2 Landforms where Aboriginal archaeological sites are likely to occur within the project corridor between Wells Crossing and Iluka Road

Project section	Land system	Specific landscape characteristics	Location within / near the project corridor	Landforms with high probability of containing Aboriginal sites	Sensitivity rating	Likely site types	Characteristics of landforms influencing probability
2,3	Glenugie Creek Catchment	Low spur lines separated by tributary streamlines.	Wells Crossing to Shark Creek	Flat areas of low spur lines overlooking water sources.	Low-Moderate	Isolated stone artefacts and small stone artefact scatters.	Sensitive landforms have been subject to some disturbance during the historical period.
3, 4, 5	Clarence River Valley	Steep Coastal Hills consisting of low hills, very steep peaks and escarpments and well defined ridgelines and gullies.	Wells Crossing to Iluka Road: Encompasses the towns of Grafton, Tyndale, Harwood, Iluka and Yamba	In close proximity to freshwater sources on locally elevated land. Larger camp sites will exist on the lower slopes and low spur line crests near substantial creeks and resource-rich swamps.	High	Stone artefact scatters and scarred trees.	Disturbance due to forestry and wildfire. Aggrading landforms may conceal archaeological sites.
3		Coastal range sitting on Kangaroo Creek Sandstone and Grafton Formation geological features.		Rock shelters associated with the Kangaroo Creek Sandstone and in close proximity to freshwater sources.	High	Rock shelters, stone artefact scatters and scarred trees.	Disturbance due forestry and wildfire. Aggrading landforms may conceal archaeological sites.
3, 4, 5, 6		Clarence River floodplain consisting of an undulating plain of low rises, levees, terraces and depressed flood channels.		Raised areas of alluvial deposits.	Low-Moderate	Isolated stone artefacts, small stone artefact scatters and scarred trees.	Aboriginal sites may be concealed by aggrading alluvium.

2.2.1. Expected site types within the project corridor

The predictive model for site types developed for the region (Table 2-2) indicates that certain site types are more likely to be prevalent in the landscape. The degree of preservation and intactness will vary dependent on historical and current land use and the nature of the site. The maps generated from the predictive model (Appendix G) show that there has been substantial disturbance of Aboriginal archaeological sites within the project corridor from post-1750 land-use practices. This is particularly pronounced for scarred trees, burials and shell middens. However, the model outputs also show that sites may persist within a number of areas both within and outside the project corridor. Site types likely to remain within the project corridor are described in Table 2-3.

Table 2-3 Summary of potential site types within the project corridor between Wells Crossing and Iluka Road

Site type	Description
Artefact scatters	Artefact scatters are the most likely sites to have survived in the archaeological record, due to the durability of their contents (predominantly stone). They are scatters of stone artefacts, occasionally with associated food material such as shell and bone. Areas subject to higher degrees of impact, such as from sugar cane farming or sand quarrying will be unlikely to preserve intact archaeological deposits, but may retain artefacts in a disturbed context. Consequently, intact archaeological deposits/sites are less likely to be found in these disturbed areas. The most likely places for artefact scatters or isolated artefacts within the project corridor are on terraces or low, flat spurs adjacent to and above swamps or permanent creeks, and occasionally on ridgelines that may have been pathways. Suitable locations occur throughout the project corridor, especially on flat raised areas adjacent to water sources within the Glenugie Creek Catchment and Clarence River Valley.
Scarred and carved trees	Scarred trees are identified by the purposeful removal of bark for use in the manufacture of artefacts such as containers, shields and canoes. The bark was also used for the construction of shelters. Carved trees also exhibit evidence of purposeful removal of bark but differ from scarred trees in that geometric patterns and figures are cut into the tree. The motifs of the mid-north coast region are mostly linear geometric patterns (Craib and Bonhomme 1995: 27). Although it is likely that scarred/carved tree sites would have been present in the project corridor in the past, the fact that there has been heavy clearing of old growth timber within and around the project corridor implies a low potential for this site type to be located. The maps in Appendix G support this notion, showing that there is a significant difference between the pre-contact (1750) predicted condition of the likelihood of scarred trees within and around the project corridor, and the current predicted condition (accounting for accumulated impact). The most likely locations of scarred and carved trees in the project corridor are within areas of extant mature native trees, such as road reserve or private property adjacent to National Parks and State Forests.
Burial sites	Burials are most commonly found in soft sandy, alluvial deposits. This tends to be because such conditions (ie light easily dug soil) facilitate interment. Burial locations are sometimes marked by carved trees. The designs on these trees were usually geometric patterns and may have signified the totemic kinship affiliations of the deceased. The most likely locations of burial sites in the project corridor are in areas of easy to dig soils of depths greater than a metre; few of these areas exist within the project corridor, as such burials are not likely to occur between Wells Crossing and Iluka Road.

Site type	Description
Shell midden sites	These are common along the coast, and in estuarine and creek areas. The term midden is a Danish word meaning a mound of kitchen refuse. In archaeological terms, a midden refers to an accumulation of shell deposited after people had collected and eaten shellfish. Middens may also contain faunal remains, stone artefacts and charcoal from cooking fires. In many areas, burials have been recorded in direct association with midden deposits. Midden sites vary widely in size, preservation and content. The most likely locations for middens in the project corridor are in the vicinity of river and creek banks and swamps, such as the Clarence River and Shark Creek.
Bora/ceremonial sites	These are usually identified as flat mounded earth rings which were used for ceremonial activities. The nature of these sites makes them particularly susceptible to impact, such as from ploughing, cane farming and logging. These sites are often known only from the oral traditions of local Aboriginal groups. Several bora rings exist or were known to have existed in the proximity of the study area, for example near Bingall Creek and just outside the project corridor around Cooks Hill. The most likely location for bora sites in the project corridor are on flat raised areas on spurs, terraces and ridges.
Natural/ mythological/ ritual sites	These may not exhibit any physical or archaeological evidence, but their identification is derived from local Aboriginal tradition and oral history. These sites often have mythological associations and are associated with ceremonial activity in the past. These sites are sometimes prominent landmarks, such as mountains, rivers, rocky outcrops, and headlands (eg Glenugie Peak, the Clarence and Richmond Rivers). A myriad of landscape factors as well as intangible cultural and social factors, influence where these sites are located. Consequently, it is very difficult to predict where currently unknown natural, mythological and/or ritual sites may be located, although they may be more likely to occur in landforms of high archaeological sensitivity. Consultation with relevant knowledge holders is usually required to locate these sites.
Stone arrangements	In the Mid-North Coast of NSW, stone arrangements usually consist of cairns and/or alignments of rocks. These features are considered by Gumbaynggir people as having ceremonial significance and are often found in relatively high and/or inaccessible places such as mountain peaks and coastal headlands. The most likely locations for these sites would be in the ranges surrounding the project corridor, and are thus unlikely to occur within the project corridor.
Waterholes or wells	Waterholes or wells can be any natural or excavated water retaining feature of either historic or prehistoric significance. In order to be considered as an archaeological site, there should be some evidence of modification or use of the site. The most likely locations of waterholes or wells are within the ranges surrounding the project corridor. The underlying sandstone of the project corridor would be unsuitable for waterhole modification; consequently, there is little likelihood of waterholes being located within the project corridor.

3. Field survey

3.1. Introduction

The team undertook the archaeological survey for the project corridor between Wells Crossing and Iluka Road in four phases between August 2010 and March 2012. The technical requirements for the survey standards are set out in the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010 and these were referred to prior to commencing works.

3.2. Previous surveys

Prior to the field survey undertaken for this report, survey was undertaken by Navin Officer (2009b) for the concept design stage of the Wells Crossing to Iluka Road Pacific Highway Upgrade. Through community consultation and analysis of the report it was determined that approximately 90.5 per cent of the project corridor (corrected to account for previously significantly disturbed areas) had been subject to previous survey and would not require further survey. This meant that the remaining the 9.5 per cent of the project corridor required survey.

3.3. Survey aims

The primary aims of the archaeological survey were:

- To improve the survey coverage of the project corridor.
- To identify sites and areas of PADs within the project corridor.
- To collaborate and consult with registered Aboriginal stakeholders.

Priority areas identified for archaeological survey comprised areas which had not been previously surveyed. A secondary aim of the archaeological survey was to undertake consultation along the project corridor with nominated Aboriginal site officers representing the registered Aboriginal stakeholders. The objective of their participation was to:

- Obtain any information relating to cultural heritage sites (archaeological and cultural) along or adjacent to the project corridor.
- Understand Aboriginal significance of sites or PAD located during the field survey.
- Discuss preliminary recommendations for Aboriginal sites and PADs located within the project corridor during the field survey.
- Discuss recommendations for further archaeological assessment of PADs located during the field survey

- Discuss recommendations for further archaeological assessment of PADs located during the field survey.

3.4. Survey timing and personnel

The archaeological survey was undertaken over the following dates:

- 23 to 27 August 2010.
- 4 to 7 October 2011.
- 25 October to 22 December 2011 (additional survey undertaken concurrent with the sub-surface test excavation program).

The field teams comprised project team archaeologists, and nominated Aboriginal site officers representing registered Aboriginal stakeholders (Table 3-1). A mix of male and female archaeologists was incorporated into the field team to allow for potential Aboriginal stakeholder preferences when sharing cultural information.

Well defined boundaries exist for Local Aboriginal land councils (LALCs), which have been developed for the most part by government agencies to assist with health, housing and other matters. However, these boundaries do not necessarily reflect traditional Aboriginal tribal or clan boundaries. Consequently, Aboriginal communities have their own views about their cultural affiliations to each other and the landscape. Where possible, the archaeology survey team enabled the registered Aboriginal stakeholders to speak for themselves as to which parts of the project corridor they assumed cultural heritage responsibility for via the Aboriginal focus group meetings (AFG).

This methodology was successful with members from Yarrawarra Cultural Centre and Grafton Ngerrie LALC and Yaegl and Birrigan Gargle LALCs working together during the survey.

Table 3-1 Survey personnel (for the project corridor between Wells Crossing and Iluka Road)

Organisation	Name	Role	Dates of participation
Yarrawarra Cultural Centre (Garby Elders)	Tim Cowan	Senior Aboriginal site officer (volunteer)	25 August 2010
Yaegl LALC (also Yaegl People Native Title claim)	Mark Laurie	Trainee Aboriginal site officer	25-27 August 2010
Yaegl LALC (also Yaegl People Native Title claim)	Ferlin (Lee) Laurie	Senior Aboriginal site officer	2-3 November 2011
Yarrawarra Cultural Centre (Garby Elders)	Milton Duroux	Senior Aboriginal Site officer	25 August 2010 7 October 2011
Yarrawarra Cultural Centre (Garby Elders)	Anthony Dootson	Trainee Aboriginal Site officer	25 August 2010 7 October 2011

Organisation	Name	Role	Dates of participation
Grafton-Ngerrie LALC	Rodney Duroux	Senior Aboriginal site officer	7 October 2011
Grafton-Ngerrie LALC	Wes Fernando	Senior Aboriginal site officer	7 October 2011
Birrigan Gargle LALC	Malcolm Brown	Aboriginal site officer	2-3 November 2011
Birrigan Gargle LALC	Kurtis Laurie	Aboriginal site officer	2-3 November 2011
Alliance	Robyn Jenkins	Supervisor / archaeologist	23-27 August 2010
Alliance	Vanessa Edmonds	Supervisor/ Archaeologist	23-27 August 2010
Alliance	Andrew Costello	Supervisor/ archaeologist	23-27 August 2010 4-7 October 2011
Alliance	Joseph Brooke	Supervisor/ archaeologist	23-27 August 2010 4-7 October 2011 2-3 November 2011
Alliance	Rani Attwood	Archaeologist	23-27 August 2010
Alliance	Erica Weston	Archaeologist	4-7 October 2011

3.5. Survey methodology

The field program focused approximately on the 9.5 per cent of the project corridor, which had not previously been surveyed, and areas where design changes had occurred. The methodology for the survey followed a standard approach:

- Survey areas were defined on the basis of landholder information. A survey area was constituted by a block of land with unique property information in a previously un-surveyed area within the project corridor.
- Property access limited the areas that could be surveyed. Therefore, the sampling strategy developed was to survey as many properties as possible within the project corridor, which had not previously been subject to survey.
- Two teams of archaeologists and Aboriginal site officers undertook a pedestrian survey in five to 10 metre wide transects across each survey area.
- Particular attention was given to areas of where ground surface visibility was possible or where the sub-surface was exposed.
- Where property access was not available, an assessment of the survey area was made from the property boundary for Aboriginal heritage potential.
- PADs were identified through a combination of desktop landform analysis and onsite landform and geomorphological analysis, in conjunction with Aboriginal site officers.

Approximately 20 per cent of the entire project corridor has been significantly disturbed by previous earthmoving works and construction (predominantly, the existing Pacific Highway). In these areas there is negligible potential for any Aboriginal heritage evidence to have survived. Consequently, these areas were marked as 'significantly disturbed' and visual inspection was used to confirm that negligible potential for heritage evidence existed in these areas. The remainder of the project corridor comprised of land where there was varying degrees of potential for Aboriginal heritage material (as per the predictive model in Table 2-2).

Where property access was possible, the locations of all Aboriginal sites and PADs were recorded using a mobile GIS Unit (Trimble® GeoXH™ GeoExplorer® or the Trimble® Nomad). This allowed for the spatial datasets collected in the field to be post-processed to sub-metre level accuracy once the global positioning system (GPS) co-ordinates have been differentially corrected.

Ground surface visibility and any sub-surface exposures were noted for each survey area, along with other observations of the area, such as; vegetation type, previous modification/disturbance, landform and land-use.

Sites were defined on the basis of the spatial extent of visible objects and where possible, the logical boundary of the landform unit on which they lay.

3.6. Survey coverage

Prior to current investigations, most of the project corridor between Wells Crossing and Iluka Road (approximately 80 per cent) had previously been surveyed or disturbed to the point where Aboriginal heritage potential had been removed. A total of 94 per cent of the project corridor has now been subject to field survey. The remainder of the project corridor is not considered a risk for cultural heritage sites or places, due to previous significant impacts, and so does not require survey, though assessment of these areas was undertaken from the property boundary to confirm low Aboriginal heritage potential.

The main constraints to survey coverage were property access permission and vegetation cover (such as heavily water-logged swamp); however, such properties were, for the most-part, still able to be assessed either from the road or an adjacent property. Where this was not possible, survey areas were assessed based on in-field consultation with sites officers and observations, topographic data, and predictive modelling.

Table 3-2 summarises the survey coverage across the project corridor. Maps in Appendix H show the survey coverage. Appendix I provides details of survey areas, including visibility for each survey area from 2010-2012 survey (previous survey data can be found in Navin Officer 2009a). Survey coverage falls under the following two categories:

- Pre-2010 Pacific Highway Upgrade Program survey, which was undertaken for the project, though prior to 2010 (Navin Officer 2009a).
- 2010 - 2012 Pacific Highway Upgrade Program survey.

Table 3-2 Survey coverage of the project corridor between Wells Crossing and Iluka Road

Land system	Project corridor area (m^2)	Survey coverage (m^2/%)	Visibility	Exposure	Effective coverage (m^2/%)
Coastal range	134,701	121,910 (91%)	50%	20%	12,191 (9%)
Glenugie Creek Catchment	2,499,145	2,453,959 (98%)	50%	10%	122,697 (5%)
Clarence River valley	7,457,503	6,696,672 (90%)	40%	10%	267,866 (4%)
Tabbimoble rises	44,059	42,784/ (97%)	30%	10%	1,283 (3%)
Total	**10,135,408**	**9,315,326 (94%)**	**42.5%**	**12.5%**	**403,992 (5.25%)**

Appendix I presents survey coverage across a range of landforms within the project corridor, overlain on a spatial model of priority areas for survey provided by modelling from OEH. Survey priority shown on the map is based on knowledge gaps, landform sensitivity and land-use impacts. Appendix I shows that the project corridor transects several areas that are considered high priority survey areas, and when combined with Appendix I it can be stated that all of the high priority survey areas within the project corridor have now been surveyed.

Generally the poor to good surface visibility and sub-surface exposure encountered across the project corridor has resulted in good effective coverage of 5.25 per cent (see Table 3-2). The higher coverage within the coastal range is predominantly a result of the higher levels of erosion within this land system. The overall level of effective coverage is considered sufficient to present an effective assessment of the Aboriginal heritage resources identified.

The survey coverage summarised in Table 3-2 was comprehensive for obtrusive site types (eg scarred trees, rock shelters), but more limited for the less obtrusive site types (eg stone artefacts, middens, burials). However, these areas were identified as PADs and assessed during the sub-surface testing program (Chapter 4).

3.7. Survey results

As a result of the several phases of survey, 15 locations with archaeological sites and/or PADs were identified within the project corridor between Wells Crossing and Iluka Road – including three new Aboriginal archaeological sites (all isolated artefacts associated with PAD) and 12 stand-alone PADs. Table 3-3 summarises all identified archaeological sites and PADs within the project corridor. The sites comprise three isolated artefacts, all with PAD components.

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Figure 3-3 Section 5 - Maclean to Iluka Road - Survey coverage

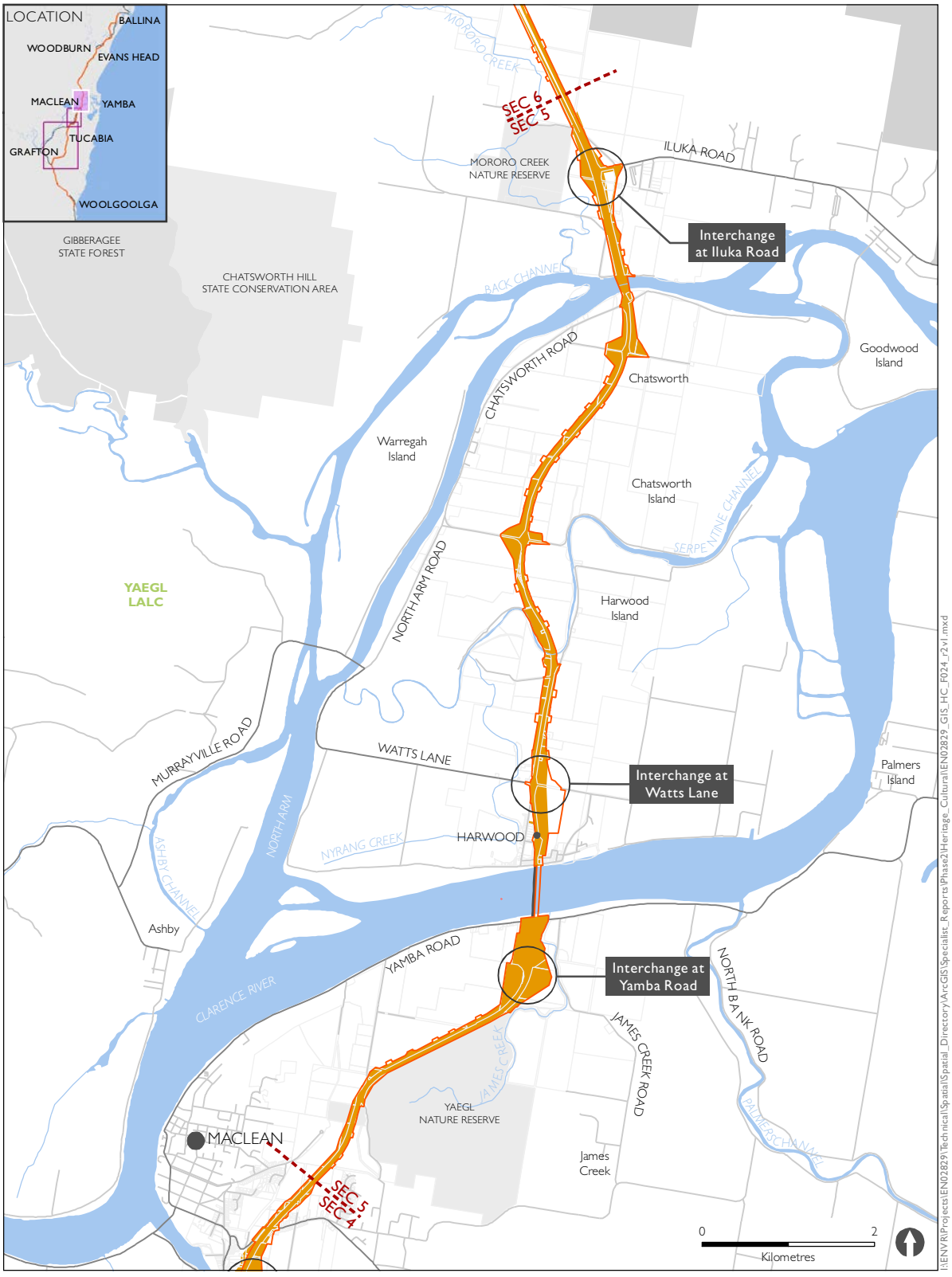


Table 3-3 Archaeological sites and PADs near or within the project corridor between Wells Crossing and Iluka Road

Project section	AHIMS ID	Name	Site type(s)	Description	Landscape unit	Potential archaeological significance	Method of identification	Near or within
3	09-4-0108	WX2I PAD 8	PAD	Located to the northeast of the intersection of Avenue Road and Wants Lane, on a relatively flat area of elevated ground north-east of dilapidated cattle yards.	Clarence River Valley – flat area on elevated ground	High	Identified in pre-2010 PHU survey, surveyed in 2011 ground survey	Within
3	09-4-0107	WX2I PAD 7	PAD	Located at the east end of Tallowood Road and northeast of Tallowood Lane, on a spur and to the south of a tributary of Coldstream River. The PAD measures approximately 50 m x 25 m and is on a small spur located between two tributaries of the Coldstream River.	Clarence River Valley – spur	High	Identified in pre-2010 PHU survey, surveyed in 2011 ground survey	Within
3	09-4-0106	WX2I PAD 6	PAD	Located at the east end of Tallowood Lane and measures approximately 75 m x 30 m on a slightly sloping area on the lower slopes of a small spur. The spur faces towards a tributary of the Coldstream River.	Clarence River Valley – lower slope of spur	High	Identified in pre-2010 PHU survey, surveyed in 2011 ground survey	Within
3	09-4-0105	WX2I PAD 5	PAD	Located northeast of Tallowood Lane and measures approximately 75 m x 30 m on the lower slopes of a small spur which faces a swampy area and the Coldstream River.	Clarence River Valley – lower slope of spur	High	Identified in pre-2010 PHU survey, surveyed in 2011 ground survey	Within
3	09-4-0104	WX2I PAD 4	PAD	Located east of Tucabia Road and measures approximately 50 m x 25 m. Located on the mid slopes of a small spur which faces a swampy area and the Coldstream River to the west.	Clarence River Valley – mid-slope of spur	High	Identified in pre-2010 PHU survey, surveyed in 2011 ground survey	Within
4	09-4-0099	Tyndale 1	Site – Isolated artefact and PAD	Located on slopes and crest of rise overlooking floodplain of Clarence River.	Clarence River Valley – slope and crest of rise	Moderate	2010 and 2011 ground survey	Within
4	13-4-0177	Tyndale 2 PAD	PAD	Well-defined silty sand palaeo-terrace overlooking swampy floodplain of Clarence River.	Clarence River Valley – floodplain (terrace)	Moderate-High	Field survey and consultation	Within

Project section	AHIMS ID	Name	Site type(s)	Description	Landscape unit	Potential archaeological significance	Method of identification	Near or within
4	13-4-0172	Shark Creek PAD 4	PAD	Upper slopes and crest of sandstone ridge spur, overlooking Shark Creek.	Clarence River Valley – coastal hills	Moderate	Field survey and consultation	Within
4	13-4-0171	Shark Creek PAD 3	PAD	Upper slopes and crest of sandstone ridge and spur above floodplain of Clarence River.	Clarence River Valley – coastal hills	Moderate	Field survey and consultation	Within
4	09-4-0098	PAD 14	PAD	Top of ridgeline, overlooking floodplain of the Clarence River.	Clarence River Valley – coastal hills	Low-Moderate	Field survey and consultation	Within
4	13-4-0173	Shark Creek PAD 1	PAD	Flat crest of gradually sloping ridge spur overlooking floodplain of Clarence River.	Clarence River Valley – coastal hills	Low-Moderate	Field survey and consultation	Within
4	13-4-0170	Shark Creek PAD 2	PAD	Flat lower slopes of spur above swampy floodplain of Clarence River.	Clarence River Valley – floodplain (terrace)	Low-Moderate	Field survey and consultation	Within
4	13-1-0185	Hirst 2 / PAD 16	Site – Isolated artefact and PAD	Located on a low ridge spur overlooking the swampy floodplain of the Clarence River.	Clarence River Valley – coastal hills	Moderate	Field survey and consultation	Within
4	09-1-0206	Hirst 1 / PAD 17	Site – Isolated artefact and PAD	Located on the middle slopes of a ridge spur overlooking the swampy floodplain of the Clarence River.	Clarence River Valley – coastal hills	Moderate-High	Field survey and consultation	Within
4	04-4-0130	PAD 15	PAD	Foot slopes at the edge of expansive swamp on Clarence River floodplain.	Clarence River Valley – floodplain (terrace)	Low-Moderate	Field survey and consultation	Within

*Potential archaeological sensitivities are developed from the predictive model, adjusted for prior land disturbances and proximity to cultural places.

4. Sub-surface testing

4.1. Introduction

As 15 areas of PAD have been identified (12 stand-alone and three associated with isolated artefacts), according to PACHCI, and the of the Department of Planning and Infrastructure's Director-General environmental assessment requirements, sub-surface testing should be undertaken in these areas to better determine the impact to Aboriginal cultural heritage values within the project corridor.

4.2. Aims

The aims for the sub-surface testing, within the project corridor between Wells Crossing and Iluka Road were to explore the sub-surface nature of the 15 PADs (either sites with PAD components or standalone PADs) identified during survey (Table 4-1). Specifically to:

- Determine the presence of sub-surface deposits for all PADs.
- Determine the nature, depth, extent and significance of archaeological deposits within the project corridor.
- Consult with registered Aboriginal stakeholders in regards to this work and the sites being tested.
- Develop recommendations to minimise or mitigate potential impacts.
- Consult with Aboriginal stakeholders in regards to these recommendations.
- Excavate consistently with the geomorphology of the relevant landform.
- Comply with the DP&I Director-General environmental assessment requirements.
- Undertake excavation with regard to the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010.
- Undertake a small amount of 'control' excavations outside PADs to test the accuracy of the predictive model.

Table 4-1 PADs and sites within the project corridor between Wells Crossing and Iluka Road, noting requirement for sub-surface testing

Project section	Name (AHIMS ID)	Type(s)	Description	Sub-surface testing required
3	WX2I PAD 8 09-4-0108	PAD	Located to the northeast of the intersection of Avenue Road and Wants Lane, on a relatively flat area of elevated ground northeast of dilapidated cattle yards.	Yes
3	WX2I PAD 7 09-4-0107	PAD	Located at the east end of Tallowwood Road and northeast of Tallowood Lane, on a spur and to the south of a tributary of Coldstream River. The PAD measures approximately 50 m x 25 m and is on a small spur located between two tributaries of the Coldstream River.	Yes
3	WX2I PAD 6 09-4-0106	PAD	Located at the east end of Tallowood Lane and measures approximately 75 m x 30 m on a slightly sloping area on the lower slopes of a small spur. The spur faces towards a tributary of the Coldstream River.	Yes
3	WX2I PAD 5 09-4-0105	PAD	Located northeast of Tallowood Lane and measures approximately 75 m x 30 m on the lower slopes of a small spur which faces a swampy area and the Coldstream River.	Yes
3	WX2I PAD 4 09-4-0104	PAD	Located east of Tucabia Road and measures approximately 50 m x 25 m. Located on the mid slopes of a small spur which faces a swampy area and the Coldstream River to the west.	Yes
4	Tyndale 1 09-4-0099	Site - Isolated artefact and PAD	Located on slopes and crest of rise overlooking floodplain of Clarence River.	Yes
4	Tyndale 2 PAD 13-1-0115	PAD	Well-defined silty sand palaeo-terrace overlooking swampy floodplain of Clarence River.	Yes
4	Shark Creek PAD 4 13-4-0172	PAD	Upper slopes and crest of sandstone ridge spur, overlooking Shark Creek.	Yes
4	Shark Creek PAD 3 13-4-0171	PAD	Upper slopes and crest of sandstone ridge and spur above floodplain of Clarence River.	Yes
4	PAD 14 09-4-0098	PAD	Top of ridgeline, overlooking floodplain of the Clarence River.	Yes

Project section	Name (AHIMS ID)	Type(s)	Description	Sub-surface testing required
4	Shark Creek PAD 1 13-4-0173	PAD	Flat crest of gradually sloping ridge spur overlooking floodplain of Clarence River.	Yes
4	Shark Creek PAD 2 13-4-0170	PAD	Flat lower slopes of spur above swampy floodplain of Clarence River.	Yes
4	Hirst 2 / PAD 16 13-1-0185	Site - Isolated artefact and PAD	Located on a low ridge spur overlooking the swampy floodplain of the Clarence River.	Yes
4	Hirst 1 / PAD 17 09-1-0206	Site - Isolated artefact and PAD	Located on the middle slopes of a ridge spur overlooking the swampy floodplain of the Clarence River.	Yes
4	PAD 15 04-4-0130	PAD	Foot slopes at the edge of expansive swamp on Clarence River floodplain	Yes

4.3. Timing and personnel

Sub-surface testing for the project corridor between Wells Crossing and Iluka Road was undertaken from 25 October to 20 November 2011 and 12 December to 18 December 2011.

Table 4-2 outlines the personnel involved in sub-surface testing.

Table 4-2 Timing and personnel involved in sub-surface testing

Week number	Alliance supervisors	Alliance archaeologists	Alliance assistants	Aboriginal stakeholders
25 October – 30 October 2011	Joseph Brooke	Robyn Jenkins Simon Crocker Erica Weston	Tristan Minter	**Yaegl LALC** Ferlin (Lee) Laurie Shane McLeay Dale Mercy **Birrigan Gargle LALC** Malcolm Brown Kurtis Laurie

Week number	Alliance supervisors	Alliance archaeologists	Alliance assistants	Aboriginal stakeholders
31 October – 6 November 2011	Joseph Brooke Robyn Jenkins	Erica Weston Simon Coxe Laura Bates Morgan Wilcox	Tristan Minter	**Yaegl LALC** Ferlin (Lee) Laurie Shane McLeay Dale Mercy **Birrigan Gargle LALC** Malcolm Brown Kurtis Laurie
7 November – 13 November 2011	Matthew Schlitz	Erica Weston Morgan Wilcox	Morgan Wilcox Tristan Minter	**Yaegl LALC** Ferlin (Lee) Laurie Shane McLeay Dale Mercy Petunia Kapeen **Birrigan Gargle LALC** Malcolm Brown Kurtis Laurie
14 November – 20 November 2011	Robyn Jenkins	Erica Weston Clair Davey Christian Thurmer Tom Hoyle	Tristan Minter	**Yaegl LALC** Ferlin (Lee) Laurie Shane McLeay Dale Mercy **Birrigan Gargle LALC** Malcolm Brown Kurtis Laurie
12 December – 18 December 2011	Vanessa Edmonds	Erica Weston Tom Hoyle Morgan Wilcox Laura Bates Simon Coxe		**Yaegl LALC** Ferlin (Lee) Laurie Shane McLeay Dale Mercy **Birrigan Gargle LALC** Malcolm Brown Kurtis Laurie

4.4. Methodology

Sub-surface test excavations took place only at PADs identified within the project corridor. The methodology was initially restricted to following the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010 until the Director-General requirements were issued on 23 November 2011. This restriction included:

- Excavating only within the project corridor.
- Excavating a series of 0.5 metre x 0.5 metre test pits by hand tools and in a controlled manner.
- Excavating below archaeological deposits and into sterile soils.
- Excavating no more than 0.5 per cent of the test area (site with PAD, PAD, or control area), unless the site is less than 50 metres squared.
- All analysis of Aboriginal objects that were uncovered during test excavation were analysed in the field.

The methodology used to test the PADs for sub-surface Aboriginal objects involved the hand excavation of 0.5 metre x 0.5 metre test pits, removing soils in excavation units of 50 millimetres. The following hand tools were used: trowel, spade, shovel and where necessary (eg heavy compact clay or gravels), mattock. In test pits where potential *in situ* Aboriginal cultural heritage material was encountered (eg in well-cemented alluvial deposits), hand tools such as trowels and straight-edged spades were used. These 0.5 metre x 0.5 metre test pits were employed to investigate the sub-surface character of soil deposits and to define the extent of sites. Test pits were aligned in either transects (spaced evenly along a line) or placed on a grid pattern, to systematically sample the PADs. Test pits were spaced at 10 metre and 20 metre intervals, depending on the observed disturbance of the area, and the predicted sensitivity of the landforms on which the PAD was located. Transects were used to sample thinner areas, whereas grids were used to sample wider areas. Seven control areas outside site/PAD boundaries were sampled to test the predictions in the predictive model; the same methods and sample approach was used in control areas. Control areas were located in areas the predictive model identified to be not likely to be sensitive for archaeological material, such as flat, flood-prone areas, or steep gradient slopes

Soil deposits were sieved using three millimetre and five millimetre hand sieves. Dependent on property access a mechanical sieve (five millimetre mesh) was also used in conjunction with hand sieves. The location of the excavation sub-surface test pits were recorded using a mobile GIS Unit (Trimble® GeoXH™ GeoExplorer® or the Trimble® Nomad). This allowed for the spatial datasets collected in the field to be post-processed to sub-metre level accuracy once the GPS co-ordinates have been differentially corrected.

All Aboriginal objects, features and other non-cultural inclusions were recorded according to their excavation unit. Records were kept of the objects provenance and cultural material of excavated soil in relation to the estimated volume of soil removed. Changes in the deposit, stratigraphy and any unusual features were recorded by the use of context sheets related to photographic records. Stratigraphic profiles of representative test pits were drawn for all PADs/sites. Descriptions of sediment colours were assessed through reference to a Munsell soil colour chart and pH values were determined through a colorimetric test. Sub-surface testing only ceased when enough information had been recovered to adequately characterise the objects present with regard to their nature and significance.

The analysis of all Aboriginal objects was undertaken in the field. All artefacts retrieved during sub-surface testing were double bagged and labelled with appropriate contextual information. Analysis was then undertaken which included all measurements, identification of material, depth and test pit locations and photos. Following detailed analysis in the field, all artefacts were left *in situ*, or reburied in the one location on the site to make relocation easier.

All excavations were backfilled with the original soil on completion of excavation and recording. Where possible, ground cover was retained for reinstatement of the test pits following backfilling. Any residual soil was scattered within the vicinity of the site at a low density.

4.4.1. Constraints

The primary constraint was related to the restriction of the excavation methodology prior to the Director-General's environmental assessment requirements being issued. In accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010, sub-surface investigation could not be undertaken in the following areas until the Director-General requirements were issued:

- In or within 50 metres of an area where burial sites are known, or are likely to exist.
- In or within 50 metres of a declared Aboriginal place.
- In or within 50 metres of a rock shelter, shell midden or earth mound.
- In areas known or suspected to be Aboriginal missions or previous Aboriginal reserves or institutes.
- In areas known or suspected to be conflict or contact sites.

General constraints included wet weather, which caused the cancellation of some fieldwork days and property access.

The analysis and interpretation of archaeological sites presented above has been preliminary in nature and subject to time constraints and the necessity of undertaking stone artefact analysis in the field rather than in a laboratory. Further archaeological assessment into the source of raw materials and the nature of stone artefact maintenance and manufacture will need to be undertaken at the salvage stage of the project.

Due to limitations in property access, control areas were excavated on the same properties as PADs.

4.5. Results

A total of 15 PADs were excavated within the project corridor between Wells Crossing and Iluka Road (Table 4-3 and

Figure 4-1). Of these 15 PADs, 9 contained sub-surface Aboriginal cultural deposits. No control test pits contained Aboriginal archaeological material (Table 4-4). The excavation included 422 test pits (0.5 metres x 0.5 metres).

Aboriginal objects were discovered from:

- 17 shovel test pits (STPs) (0.5 metre x 0.5 metre) out of 422 excavated.
- Surface finds (5 artefacts).

A summary and description of all excavations can be found in Appendix J, K and L. Locations of excavations are shown in Figure 4-2, Figure 4-3, Figure 4-4, Figure 4-5 and Figure 4-6.

Table 4-3 Summary of excavations and Aboriginal objects recovered during sub-surface testing

Site name (AHIMS ID)	GPS co-ordinates Easting/ Northing (MGA Zone 56)	Potential archaeological sensitivity	Landscape unit	Number of investigations (STPs)	Aboriginal objects
WX2I PAD 8 09-4-0108	506148 / 6708654	High	Clarence River Valley – flat area on elevated ground	26 (0.5 m x 0.5 m)	None
WX2I PAD 7 09-4-0107	513714 / 6721074	High	Clarence River Valley – spur	24 (0.5 m x 0.5 m)	2 artefacts (chert)
WX2I PAD 6 09-4-0106	513816 / 6721563	High	Clarence River Valley – lower slope of spur	27 (0.5 m x 0.5 m)	1 artefact (crystal quartz)
WX2I PAD 5 09-4-0105	513617 / 6722907	High	Clarence River Valley – lower slope of spur	9 (0.5 m x 0.5 m)	1 artefact (quartz)
WX2I PAD 4 09-4-0104	513144 / 6723649	High	Clarence River Valley – mid-slope of spur	44 (0.5 m x 0.5 m)	5 artefacts (chalcedony, silcrete, quartzite)
Tyndale 1 09-4-0099	515425 / 6730924	Moderate	Clarence River Valley – slope and crest of rise	58 (0.5 m x 0.5 m)	2 artefacts (river cobble, chert)
Tyndale 2 PAD 13-1-0115	515711 / 6731230	Moderate-High	Clarence River Valley – floodplain (terrace)	17 (0.5 m x 0.5 m)	9 artefacts (basalt, chalcedony, chert, quartz, silcrete)
Shark Creek PAD 4 13-4-0172	519311 / 6734744	Moderate	Clarence River Valley – coastal hills	21 (0.5 m x 0.5 m)	None
Shark Creek PAD 3 13-4-0171	519557 E / 6735577 N	Moderate	Clarence River Valley – coastal hills	23 (0.5 m x 0.5 m)	None

Site name (AHIMS ID)	GPS co-ordinates Easting/ Northing (MGA Zone 56)	Potential archaeological sensitivity	Landscape unit	Number of investigations (STPs)	Aboriginal objects
PAD 14 09-4-0098	519444 / 6735386	Low-Moderate	Clarence River Valley – coastal hills	19 (0.5 m x 0.5 m)	None
Shark Creek PAD 1 13-4-0173	519601 / 6736126	Low-Moderate	Clarence River Valley – coastal hills	38 (0.5 m x 0.5 m)	None
Shark Creek PAD 2 13-4-0170	519526 / 6736345	Low-Moderate	Clarence River Valley – floodplain (terrace)	27 (0.5 m x 0.5 m)	3 artefacts (silcrete, chert)
Hirst 2 / PAD 16 13-1-0185	519706 / 6736951	Moderate	Clarence River Valley – coastal hills	43 (0.5 m x 0.5 m)	1 artefact (chert)
Hirst 1 / PAD 17 09-1-0206	519688 / 6737472	Moderate-High	Clarence River Valley – coastal hills	38 (0.5 m x 0.5 m)	1 artefact (river cobble)
PAD 15 04-4-0130	520235 / 6740251	Low-Moderate	Clarence River Valley – floodplain (terrace)	8 (0.5 m x 0.5 m)	None

Table 4-4 Summary of sub-surface testing of control areas

Potential archaeological sensitivity	Landscape units	Number of investigations	Aboriginal objects
Low	Clarence River Valley – floodplain (terrace)	12 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – floodplain (terrace)	12 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – floodplain (terrace)	12 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – coastal hills	13 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – coastal hills	13 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – coastal hills	13 (0.5 m x 0.5 m)	None
Low	Clarence River Valley – coastal hills	13 (0.5 m x 0.5 m)	None

Figure 4-1 Wells Crossing to Iluka Road - Sub-surface testing

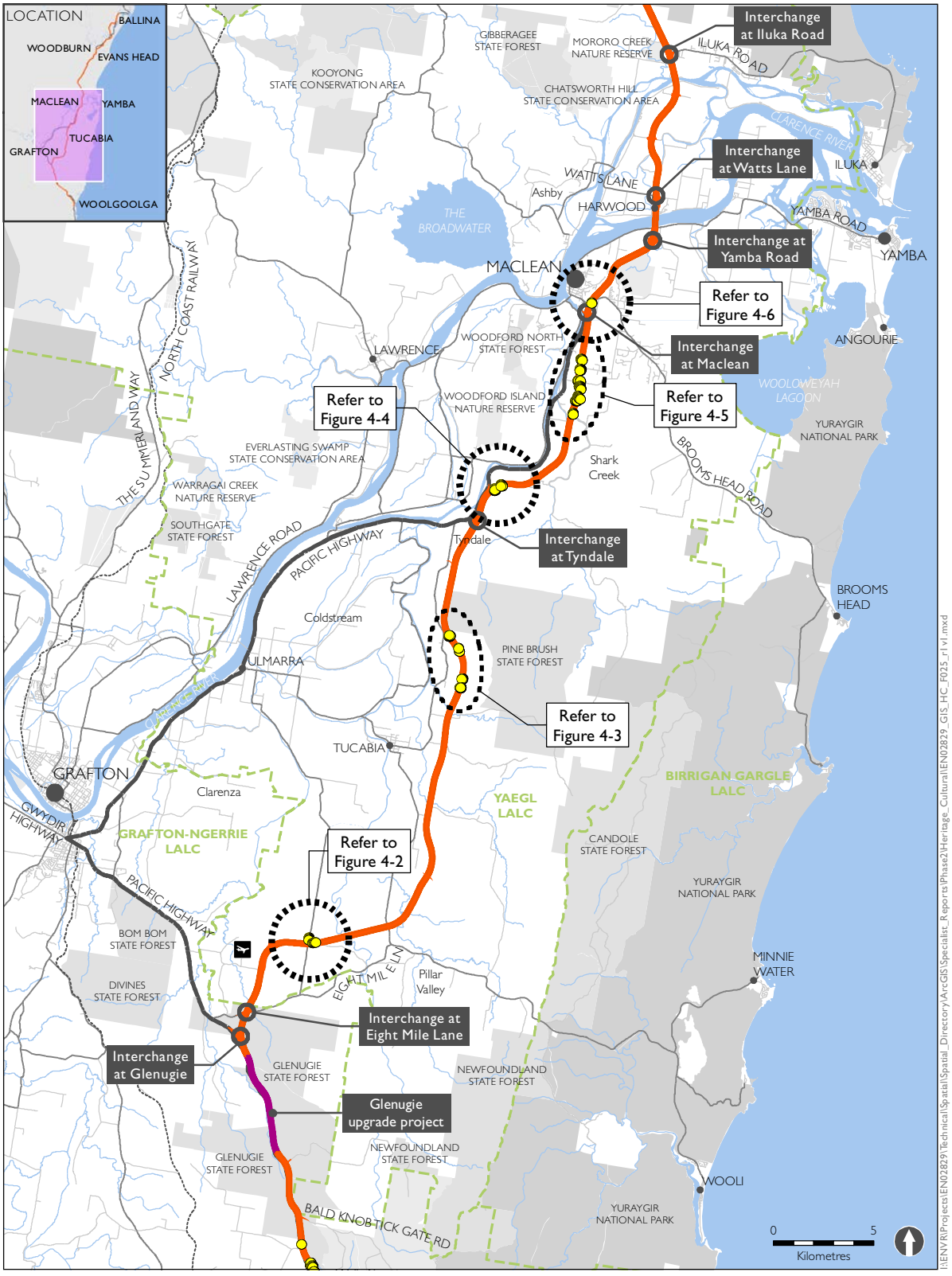


Figure 4-2 Sub-surface testing 1

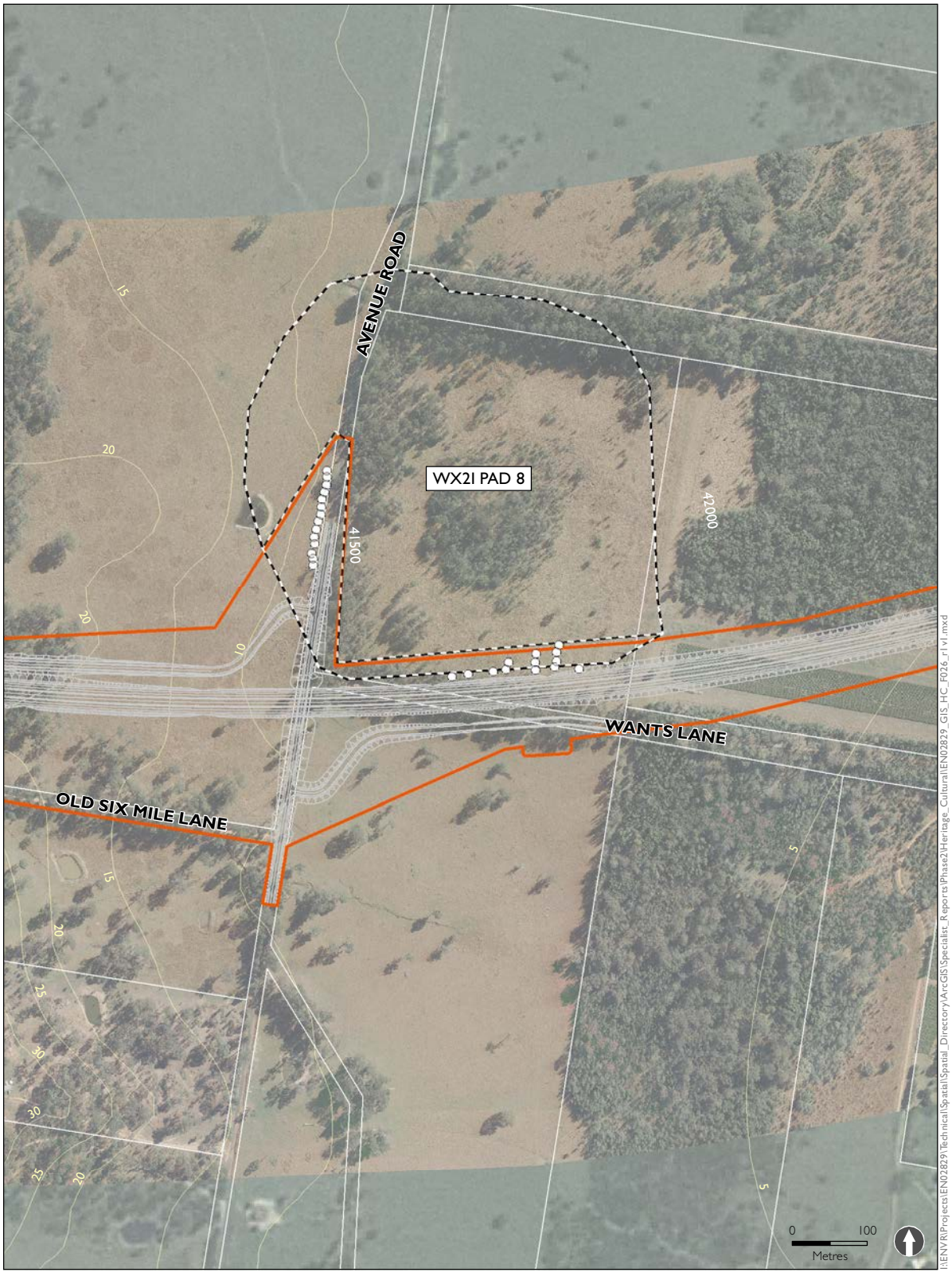


Figure 4-3 Sub-surface testing 2

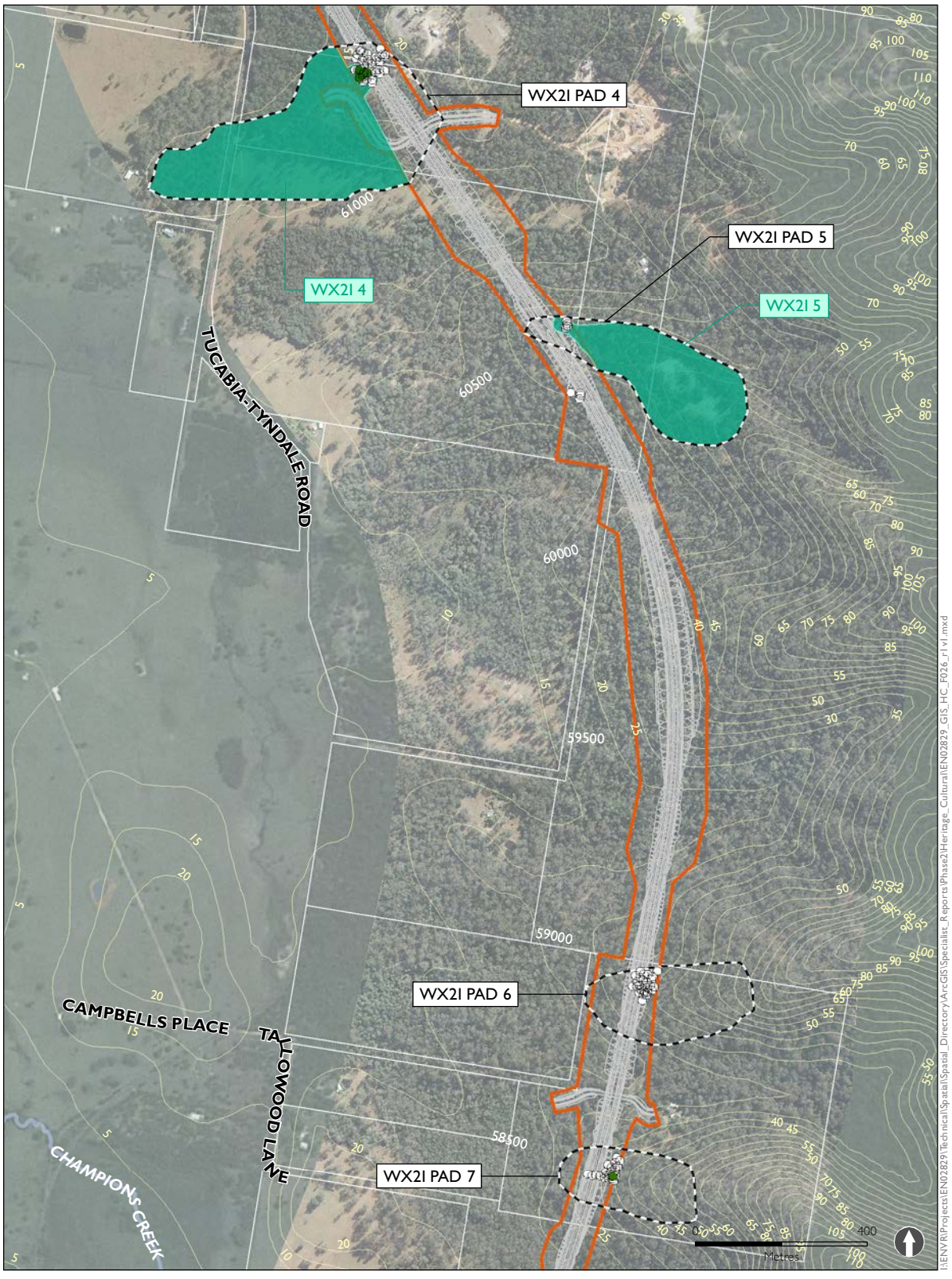


Figure 4-4 Sub-surface testing 3

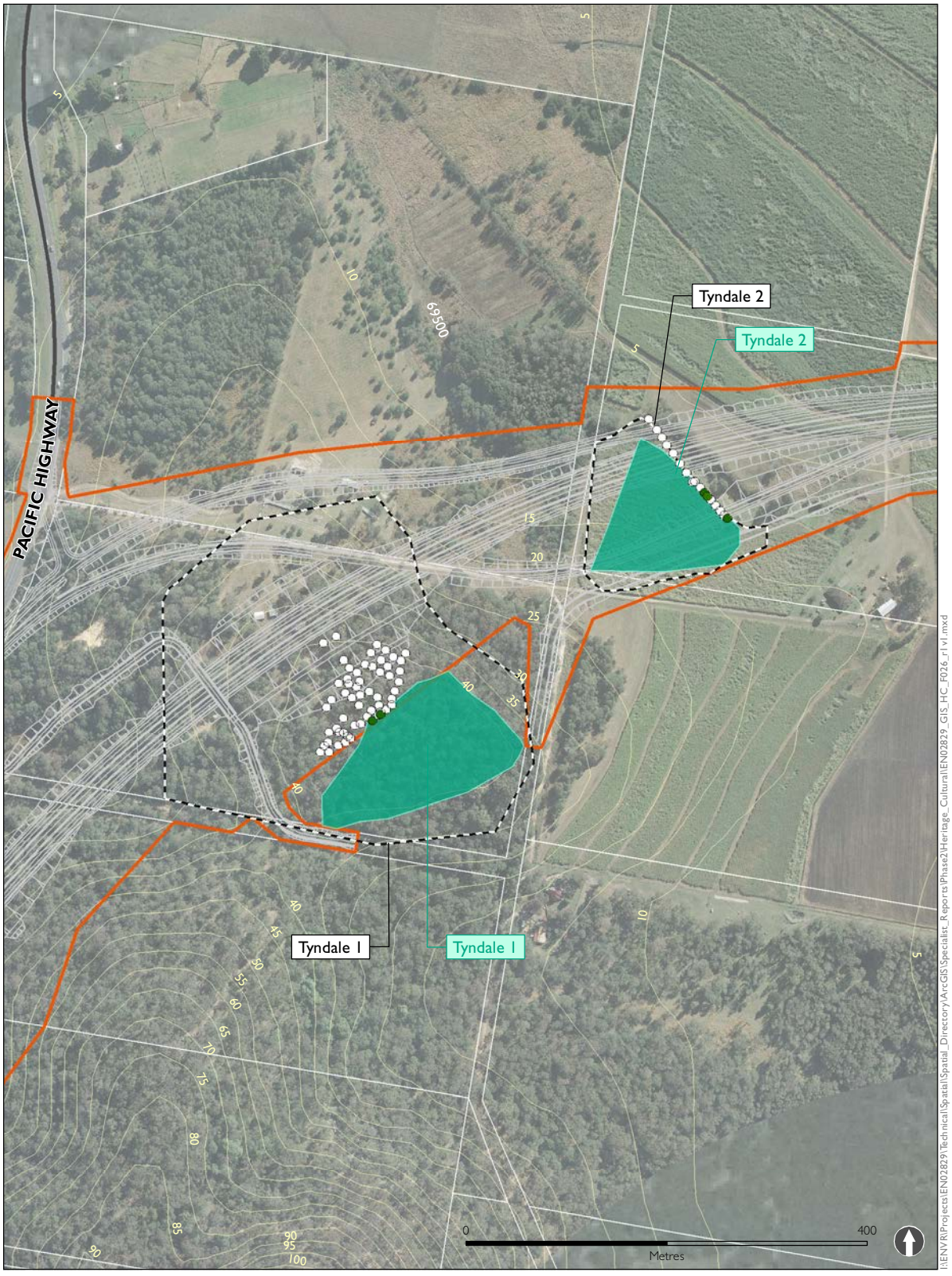
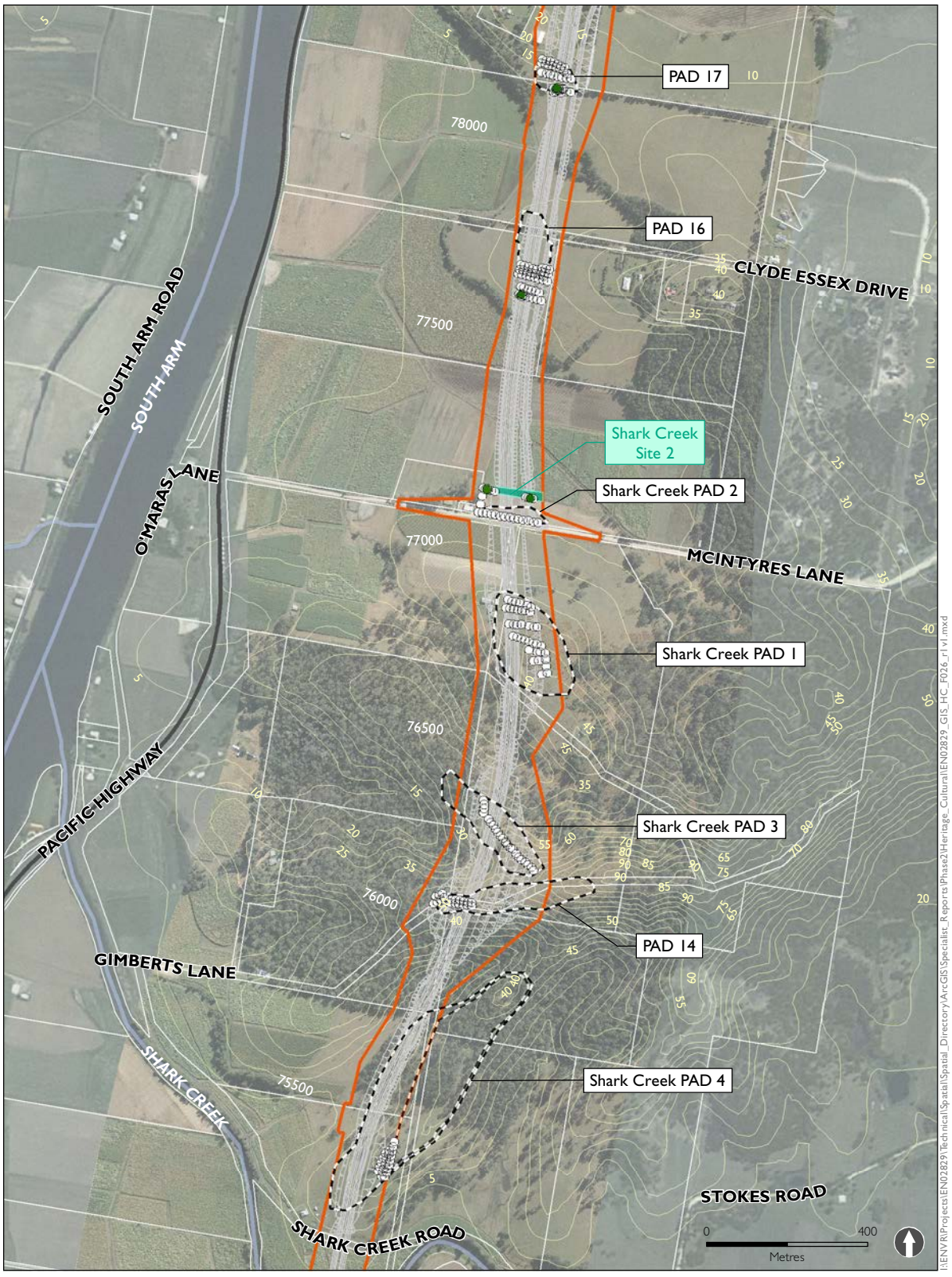


Figure 4-5 Sub-surface testing 4



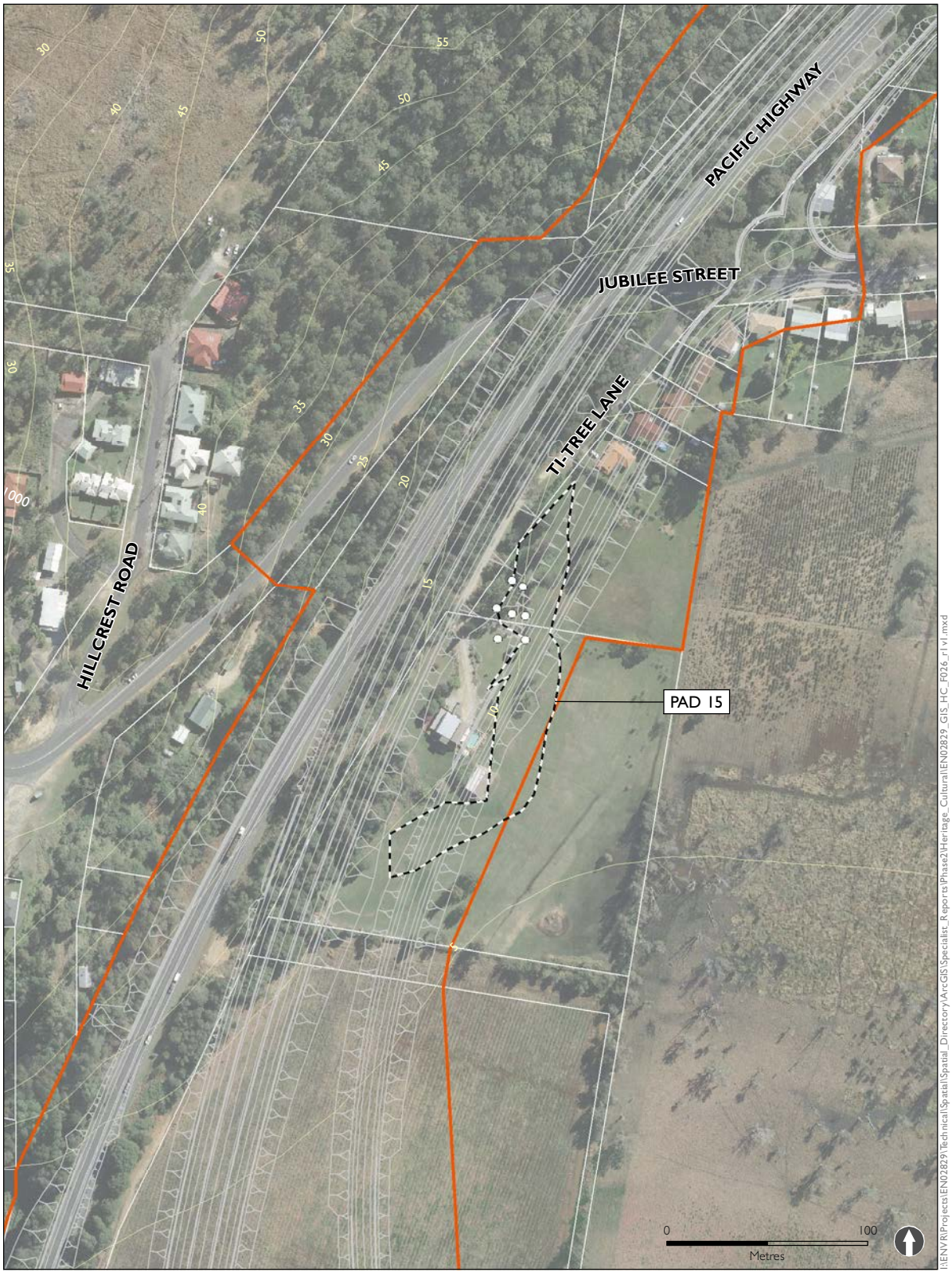
The project
Road design detail

Aboriginal heritage areas
Scarred tree
Site area
Initial PAD area

Sub-surface testing locations
Reburial point
Shovel probe
Test pit
Mechanical trench

Number of artefacts
low high

Figure 4-6 Sub-surface testing 5



Prior to the sub-surface testing a total of three artefact sites had been identified (Tyndale 1, Hirst 1 and Hirst 2). The sub-surface testing resulted in:

- A total of nine sites containing further sub-surface material (Table 4-3).
- Control areas sampled contained no Aboriginal archaeological material (Table 4-4).

Stratigraphy drawings were undertaken at all excavations to ensure that any changes in soil profile were accurately recorded. These can be found in Appendix L.

5. Archaeological sites

5.1. Summary of archaeological sites

Following survey and sub-surface testing, sites/PADs were determined either:

1. To be sites.
2. To not be sites.
3. Determined to not be sites within the project corridor, but still sites/PADs outside the project corridor.

Table 5-1 outlines the revised status and the new names for all the areas that were subject to investigation.

Table 5-1 Status of PADs and sites near or within the project corridor between Wells Crossing and Iluka Road following survey and sub-surface testing

Project section	Name (AHIMS ID)	Type(s)	Description	Investigation	New name	New site type(s)	Near or within project
3	WX2I PAD 8 09-4-0108	PAD	Located to the northeast of the intersection of Avenue Road and Wants Lane, on a relatively flat area of elevated ground northeast of dilapidated cattle yards.	Test-excavation and survey	WX2I PAD 8	PAD (outside project corridor)	Near – immediately adjacent to west
3	WX2I PAD 7 09-4-0107	PAD	Located at the east end of Tallowwood Road and northeast of Tallowood Lane, on a spur and to the south of a tributary of Coldstream River. The PAD measures approximately 50 m x 25 m and is on a small spur located between two tributaries of the Coldstream River.	Test-excavation and survey	WX2I Site 7	Site – Artefact scatter	Within
3	WX2I PAD 6 09-4-0106	PAD	Located at the east end of Tallowood Lane and measures approximately 75 m x 30 m on a slightly sloping area on the lower slopes of a small spur. The spur faces towards a tributary of the Coldstream River.	Test-excavation and survey	WX2I Site 6	Site – Isolated artefact	Within
3	WX2I PAD 5 09-4-0105	PAD	Located northeast of Tallowood Lane and measures approximately 75 m x 30 m on the lower slopes of a small spur which faces a swampy area and the Coldstream River.	Test-excavation and survey	WX2I Site 5	Site – Isolated artefact	Within

Project section	Name (AHIMS ID)	Type(s)	Description	Investigation	New name	New site type(s)	Near or within project
3	WX2I PAD 4 (09-4-0104)	PAD	Located east of Tucabia Road and measures approximately 50 m x 25 m. Located on the mid slopes of a small spur which faces a swampy area and the Coldstream River to the west.	Test-excavation and survey	WX2I Site 4	Site – Artefact scatter	Within
4	Tyndale 1 (09-4-0099)	Site - Isolated artefact and PAD	Located on slopes and crest of rise overlooking floodplain of Clarence River.	Test-excavation and survey	Tyndale 1	Site – Artefact scatter	Within
4	Tyndale 2 PAD (13-1-0115)	PAD	Well defined silty sand palaeo-terrace overlooking swampy floodplain of Clarence River.	Test-excavation and survey	Tyndale 2 Site	Site – Artefact scatter	Within
4	Shark Creek PAD 4 (13-4-0172)	PAD	Upper slopes and crest of sandstone ridge spur, overlooking Shark Creek.	Test-excavation and survey	Shark Creek PAD 4	PAD (outside project corridor)	Near – immediately adjacent to north east
4	Shark Creek PAD 3 (13-4-0171)	PAD	Upper slopes and crest of sandstone ridge and spur above floodplain of Clarence River.	Test-excavation and survey	Shark Creek PAD 3	PAD (outside project corridor)	Near – immediately adjacent to east
4	PAD 14 (09-4-0098)	PAD	Top of ridgeline, overlooking floodplain of the Clarence River.	Test-excavation and survey	None	No longer a site or PAD	N/A
4	Shark Creek PAD 1 (13-4-0173)	PAD	Flat crest of gradually sloping ridge spur overlooking floodplain of Clarence River.	Test-excavation and survey	None	No longer a site or PAD	N/A
4	Shark Creek PAD 2 (13-4-0170)	PAD	Flat lower slopes of spur above swampy floodplain of Clarence River.	Test-excavation and survey	Shark Creek Site 2	Site – Artefact scatter	Within
4	Hirst 2 / PAD 16 (13-1-0185)	Site - Isolated artefact and PAD	Spur overlooking the swampy floodplain of the Clarence River.	Test-excavation and survey	Hirst 2	Site – Isolated artefact	Within
4	Hirst 1 / PAD 17 (09-1-0206)	Site - Isolated artefact and PAD	Middle slopes of a ridge spur overlooking the swampy floodplain of the Clarence River.	Test-excavation and survey	Hirst 1	Site – Isolated artefact	Within
4	PAD 15 (04-4-0130)	PAD	Foot slopes at the edge of expansive swamp on Clarence River floodplain.	Test-excavation and survey	None	No longer a site or PAD	Within

5.2. Archaeological analysis

5.2.1. Introduction

Archaeological sites are often said to be records of 'stone and bone', two of the most durable products of human activity. Stone artefacts being inorganic do not deteriorate rapidly in a human time scale and are ubiquitous reminders of human activity in the past. Understanding stone use in the past allows interpretations of human behaviour to be made. Interpretation of human behaviour from stone material is derived from fracture mechanics studies, or why different materials fracture in different ways when struck by objects.

Based on the recording undertaken of the stone artefacts in the field, analysis of the data collected from each individual archaeological site was undertaken in order to present a site specific interpretation of the stone artefacts at each locality. A more detailed stone artefact analysis undertaken under laboratory conditions would examine patterns of raw material use and movement between sites within the region; however, due to the preliminary nature of this analysis, this has not been undertaken at this stage. The occurrence and distribution of stone raw materials are discussed to attempt to gain insights into the way people were using each of the archaeological sites.

The sites that yielded a large sample (ie large numbers of artefacts) are given more detailed analysis below. It is not possible to undertake detailed analysis of those sites with small sample sizes (few artefacts), as inferences made on these samples are not robust, consequently analysis of these sites is summary in nature.

Appendix M contains photos of a selection of Aboriginal objects from each site.

5.2.2. Methodology

Each stone artefact was classified according to its raw material type and technological type category and entered into a database. In classifying each artefact into a technological category careful examination of the artefact was undertaken. Initial examination of the artefact involved deciding the location of the ventral and dorsal sides. Negative flake scars or cortex was indicative of dorsal attributes. Bulbs of percussion, impact points, fissures and ripples indicate ventral attributes. These indicators as well as others such as a platform and termination point are the deciding factors as to which technological category each piece was assigned.

The maximum dimension measurement was taken on all stone artefacts. Measurements of length, width and thickness were taken on complete stone artefacts (flakes) only. Platform measurements and termination descriptions were taken on stone artefacts, where these attributes were present. Cortex or the amount of natural stone still left on the dorsal side of the flake was also recorded for all artefacts. The amount of cortex present on a flake has been used to indicate the reduction stage in which a flaked piece was removed from a core (the parent material). This is due to the exclusive presence of cortex on the exterior surface of the lithic raw material, and the fact that the exterior will be the first area removed during core reduction.

A glossary of the terms used in the stone analysis is provided in Appendix B.

5.2.3. Constraints

The analysis and interpretation of archaeological sites presented above has been preliminary in nature and subject to time constraints and the necessity of undertaking stone artefact analysis in the field rather than in a laboratory. Further archaeological assessment into the source of raw materials and the nature of stone artefact maintenance and manufacture will need to be undertaken at the salvage stage of the project. Additionally, stone artefacts recorded during investigations prior to 2010 are not included in this analysis, as attributes recorded differ from those here.

5.2.4. Archaeological sites

This Chapter discusses interpretations of findings at all archaeological sites located within the project corridor. Linear corridor projects like this offer, a cross section sample of numerous landforms within a region, allowing some degree of comparative analysis between landforms. Consequently, this section briefly examines the relationship between the occurrence of archaeological and cultural sites, and the landscape in the project corridor. The occurrence and distribution of stone raw materials are discussed to attempt to gain insights into the way people were occupying and moving across the landscape, and exploiting resources.

Appendix M contains photos of a selection of Aboriginal objects from each site.

Each of the nine sites recorded (with a sub-surface component) within the project corridor between Wells Crossing and Iluka Road contained less than 10 artefacts. Due to the low number of artefacts located at each site only a limited interpretation has been undertaken. A summary of these sites and their contents is provided in Table 5-2.

All of these sites were broadly located within the Clarence River Valley landscape unit. Of these a total of six sites were within the steep coastal hills, one within the coastal range and two were associated with the low rises of the floodplain (Table 5-3).

Table 5-2 Summary of sites with less than 10 artefacts recovered

Site name	No. of artefacts	Material	Depth range (mm)	Comments
WX2I Site 7	2	Chert	150-550	Refit together
WX2I Site 6	1	Crystal quartz	0-150	
WX2I Site 5	1	Quartz	600	
WX2I Site 4	5	Chalcedony, quartzite, silcrete	50-450	
Tyndale 1	2	Chert, unspecified	200-300	Manuport
Tyndale 2 Site	9	Basalt, chalcedony, chert, quartz, silcrete	0-450	Multi-platform cores, single platform core
Shark Creek Site 2	3	Chert, silcrete	10-300	
Hirst 2	1	Chert	50-200	
Hirst 1	1	River cobble	0-120	

5.2.5. Landforms and predictive model

Generally, the predictive model (see Table 2-2) is supported with regard to the observed distribution of sites in the landscape. As predicted, greater numbers of archaeological and sites occurred in areas which were assessed as having higher archaeological sensitivity within the project corridor.

Table 5-3 Archaeological sites located within the broad archaeological landscape units

Broad archaeological landscape units	Specific landscape characteristics	Project section	Sensitivity rating	Number of sites (% of total sites)	Sites
Glenugie Creek Catchment	Low spur lines separated by tributary streamlines.	2,3	Low-Moderate	-	-
Clarence River Valley	Steep Coastal Hills consisting of low hills, very steep peaks and escarpments and well defined ridgelines and gullies	3, 4, 5	High	6 (67%)	Hirst 2 Hirst 1 WX2I Site 7 WX2I Site 6 WX2I Site 5 WX2I Site 4
	Coastal range sitting on Kangaroo Creek Sandstone and Grafton Formation geological features.	3	High	1 (11%)	Tyndale 1
	Clarence River floodplain consisting of an undulating plain of low rises, levees, terraces and depressed flood channels.	3, 4, 5, 6	Low-Moderate	2 (22%)	Shark Creek Site 2 Tyndale 2

Archaeological sites recorded during the field work to date have been found predominantly on the low rises associated with tributaries, rivers or swamps. These landforms would have provided relatively flat areas suitable for camping close to resources, elevated above the flood zone and in the case of low rises and spurlines with views of the surrounding landscape. Control excavations yielded no traces of Aboriginal cultural heritage, which suggests the predictive model is well founded, though additional control testing beyond the scope of this study could refine this. Previous ground-disturbance appeared to be a major factor in PADs that didn't yield Aboriginal cultural material, suggesting that some of these areas may once have contained material remains, but were subsequently removed through post-contact activities.

Further archaeological work (eg salvage) as part of the future project stages of the project between Wells Crossing and Iluka Road and north to Ballina further south to Woolgoolga, as well as other projects in the surrounding region, will be useful in further refining predictions regarding the region. Areas for particular refinement would be further categorisation and mapping of the landforms in the area to enable more accurate identification of sensitive landforms.

5.2.6. Summary

The nature of the archaeological sites recorded within the project corridor between Wells Crossing to Iluka Road allows for several possible insights into pre-contact occupation of the area. The archaeological sites recorded within the project corridor represent this movement around the landscape, such as resource gathering sites, travelling routes or temporary camp sites along ridges, or occupation sites next to water sources. The location and nature of the sites indicates that Aboriginal People were utilising river and swamp margins for resource extraction.

The distribution of the archaeological sites recorded in the project corridor reinforces the pattern suggested in the predictive model. Elevated areas, such as rises adjacent to swamps, creeks and rivers are generally where archaeological sites were located. These areas would have provided areas of good vantage and with good ventilation in warmer months. They would have provided access to water sources and associated resource-rich zones around them. During wetter months, these areas would have provided well-drained, drier areas above the lower-lying waterlogged, flooded, or flood prone areas.

5.2.7. Conclusion

This archaeological assessment has added substantial data to the archaeological record of this region. It has introduced important information for informing the detailed design and impact assessment for the Pacific Highway Woolgoolga to Ballina upgrade project between Wells Crossing to Iluka Road. The study has also enhanced the record in an area where archaeological data was limited. The extensive sub-surface testing undertaken for this assessment, has made a particularly important contribution to our understanding of the archaeology of Aboriginal occupation of this region – a region that was otherwise characterised by little information of the important, and otherwise hidden sub-surface component.

The nature of the archaeology discovered within the project corridor does not represent a significant difference from that located in the surrounding region. Thus the results do not present any major constraint to the project corridor between Wells Crossing and Iluka Road.

6. Significance assessment

A complete significance assessment of all identified Aboriginal cultural heritage values near and within the project corridor is presented in the CHAR, with only the archaeological sites assessed here.

6.1. Methodology

6.1.1. Basis for assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. Evidently, this can be challenging as sites are important for different reasons to different people, and even at different times. The assessment of Aboriginal cultural heritage in this assessment is based upon the four values of the *Australia ICOMOS Burra Charter* (Australian ICOMOS 1999).

- Social values.
- Historical values.
- Scientific values.
- Aesthetic values.

Each of these values is assessed below, and an overall significance is then given based on an average across the values. This is inherently a reductive process, and oversimplifies what is important to a range of different stakeholders, but is a necessary process in being able to create comparative values between sites. The significance of each site ultimately feeds the management of sites and places (see Chapter 9).

6.1.2. Social significance

The significance of a site does not relate only to its scientific or research value. Aboriginal people's views on the significance of archaeological sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed from consultation with the nominated Aboriginal sites officers and other members of the stakeholders, including Elders, both during and following field assessments. It should be noted that Aboriginal significance assessed in this manner may not reflect the views of all members of the community.

6.1.3. Scientific significance

Aboriginal site significance assessments need to consider both the scientific and social or cultural values of a site. Research potential or scientific significance of an Aboriginal archaeological site can be assessed by utilising the criteria set out below. Social or cultural values of a site can only be established through Aboriginal consultation.

Criteria used for assessing scientific significance for Aboriginal archaeological sites are described below. Ratings are low, moderate or high.

- **Site integrity** – The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through a number of factors among which are: natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals.
- **Site structure** – Structure refers to a site's physical dimensions, that is, size and stratification, or sub-surface deposits. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts.
- **Site contents** – This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied amount of organic and non organic materials are considered to have greater research potential than those sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. With scarred trees contents may refer to the size and type of scar or how many there are on the one tree.
- **Representativeness and rarity** – Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being undertaken. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (OEH 2011:10).

6.1.4. Aesthetic significance

This refers to the 'sensory' value of a place, and can include aspects such as form, texture, and colour, and can also include the smell and sound elements associated with use or experience of a site (Australian ICOMOS 1999). Aesthetic significance can be closely linked to the social value of a site.

6.1.5. Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

6.1.6. Scale of significance

Significance of sites and places is assigned to different geographic scales, such as local, regional, State and National, appropriate to the scale of importance. For example, Uluru is significant at a National (and World) scale, whereas a local historic building may only be significant on a local scale. This is reflected in the variety of heritage lists held by local councils, up to State and Federal government. In scale of significance, the criteria presented above as well as educational or research potential, representativeness and rarity (Australian ICOMOS 1999) have been considered in determinations of significance.

Each site has been assessed and its scale of significance has been identified as being of importance at the State, regional or local level. Each site has also been given a grading of its significance overall based on the grading of each of the individual values. The gradings of low, moderate and high have been assigned comparatively across the sites investigated in the region.

6.1.7. WX2I Site 7 (AHIMS ID 09-4-0107)

Social significance

- The artefact scatter at WX2I Site 7 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 7 consists of an artefact scatter comprising two chert artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the middle and lower slopes of a sandy rise and subject to erosion processes and possibly land clearing in the past. The site has a low rating for structure as it consists of only two artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 7 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.8. WX2I Site 6 (AHIMS ID 09-2-0106)

Social significance

- The isolated artefact at WX2I Site 6 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 6 consists of a single, isolated quartz artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the middle slopes of a sandy rise and subject to erosion processes and possibly land clearing in the past. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 6 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.9. WX2I Site 5 (AHIMS ID 09-4-0105)

Social significance

- The isolated artefact at WX2I Site 5 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 5 consists of a single, isolated quartz artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located mid-slope near a rise, it is also near a service road and there is evidence of water erosion processes. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 5 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.10. WX2I Site 4 (AHIMS ID 09-4-0104)

Social significance

- The artefact scatter at WX2I Site 4 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- WX2I Site 4 consists of a scatter of five artefacts comprising chalcedony, silcrete and quartzite. The site has low scientific significance as it is ranked as having low integrity, low contents, low structure and low representativeness/rarity.
- The site has a low ranking for integrity as it is located near a track on the top of a spur in an area subject to logging, land clearance and near residential properties. The site has a low rating for structure as it consists of only five artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall WX2I Site 4 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.11. Tyndale 1 (AHIMS ID 09-4-0099)

Social significance

- The artefact scatter at Tyndale 1 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Tyndale 1 consists of an artefact scatter comprising two artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.

- The site has a low ranking for integrity as it is located on the mid-upper slope of a hill, in semi-closed forest with rocky exposures and sandy soils. Other ground disturbance is evident in the vicinity with, machinery sheds and driveway. The site has a low rating for structure as it consists of only two artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Tyndale 1 has low significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.12. Tyndale 2 (AHIMS ID 13-1-0115)

Social significance

- The artefact scatter at Tyndale 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Tyndale 2 consists of an artefact scatter comprising nine artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on a landscape which is currently being actively farmed for sugar cane. The site has a low rating for structure as it consists of only nine artefacts, and there is little stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.

- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Tyndale 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.13. Shark Creek Site 2 (AHIMS ID 13-4-0170)

Social significance

- The artefact scatter at Shark Creek Site 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Shark Creek Site 2 consists of an artefact scatter comprising three artefacts. The site has low scientific significance as it is ranked as having low integrity, low structure, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the lower slopes of a spur, above a floodplain. The area has previously been cleared and is currently producing a sugar cane crop. The site has a low rating for structure as it consists of only three artefacts, and there is no stratification or structure of archaeological deposit evident. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as artefact scatters are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform. The only value for research or education would be that the two artefacts can be re-fitted together to indicate part of the process of manufacture.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Shark Creek Site 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.14. Hirst 2 (AHIMS ID 13-1-0185)

Social significance

- The isolated artefact at Hirst 2 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Hirst 2 consists of a single, isolated chert artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located on the mid to lower slope on the south side of a spur, overlooking a floodplain and subject to erosion processes. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Hirst 2 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.1.15. Hirst 1 (AHIMS ID 09-1-0206)

Social significance

- The isolated artefact at Hirst 1 has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way.

Historical significance

- The site does not meet this criterion.

Scientific significance

- Hirst 1 consists of a single, isolated river cobble artefact. The site has low scientific significance as it is ranked as having low integrity, low contents and low representativeness/rarity.
- The site has a low ranking for integrity as it is located mid-slope, in an area where vegetation has previously been cleared. The site cannot be rated for structure as it consists of a single artefact, and stratification/structure of archaeological deposit cannot exist. The site has a low contents ranking as the raw materials are common to the area. The site has a low representativeness ranking as isolated artefacts are common within the region.
- The site has limited research potential and limited local educational potential for researching and teaching the way local Aboriginal populations used this type of landform.

Aesthetic significance

- The site does not meet this criterion.

Summary statement of significance

- Overall Hirst 1 has low level significance at the local level. It has low social significance as it provides evidence of the use of the area by Aboriginal people in a limited way. It has low scientific significance due to its low density, common raw material and overall common presence in the region. The site has limited research and educational potential about the way local Aboriginal populations used this type of landform.

6.2. Summary

The scientific significance assessment is summarised in Table 6-1 and the overall significance assessment of Aboriginal archaeological sites is shown in Table 6-2.

Table 6-1 Scientific significance assessment of archaeological sites near or within the project corridor, between Wells Crossing and Iluka Road

AHIMS ID	Name	Site type	Integrity	Structure	Contents	Represent-ativeness / Rarity	Scientific significance
09-4-0107	WX2I Site 7	Low	Low	Low	Low	Low	Low
09-4-0106	WX2I Site 6	Low	Low	Low	Low	Low	Low
09-4-0105	WX2I Site 5	Low	Low	Low	Low	Low	Low
09-4-0104	WX2I Site 4	Low	Low	Low	Low	Low	Low
09-4-0099	Tyndale 1	Low	Low	Low	Low	Low	Low
13-4-0115	Tyndale 2	Low	Low	Low	Low	Low	Low
13-4-0170	Shark Creek Site 2	Low	Low	Low	Low	Low	Low
13-1-0185	Hirst 2	Low	Low	Low	Low	Low	Low
09-1-0206	Hirst 1	Low	Low	Low	Low	Low	Low

Table 6-2 Summary of significance assessment for sites near or within the project corridor, between Wells Crossing and Iluka Road

AHIMS ID	Name	Scientific significance	Cultural significance	Aesthetic significance	Historical significance	Overall significance
09-4-0107	WX2I Site 7	Low	Low	n/a	n/a	Low
09-4-0106	WX2I Site 6	Low	Low	n/a	n/a	Low
09-4-0105	WX2I Site 5	Low	Low	n/a	n/a	Low
09-4-0104	WX2I Site 4	Low	Low	n/a	n/a	Low
09-4-0099	Tyndale 1	Low	Low	n/a	n/a	Low
13-4-0115	Tyndale 2	Low	Low	n/a	n/a	Low
13-4-0170	Shark Creek Site 2	Low	Low	n/a	n/a	Low
13-1-0185	Hirst 2	Low	Low	n/a	n/a	Low
09-1-0206	Hirst 1	Low	Low	n/a	n/a	Low

7. Impact assessment

A complete impact assessment of all identified Aboriginal cultural heritage values near and within the project corridor is presented in the CHAR, with only impact to the archaeological sites assessed here.

This Chapter looks at sites where:

- Avoidance will occur due to changes to the project corridor, and site may fall partially or wholly outside the project corridor, or some portion may remain within the project corridor but be avoided by construction.
- A site or place may not be directly impacted by construction of the project, but may be at risk of indirect impacts, such as a secret place becoming more visible/accessible due to the construction of the project.
- Partial impact to a site or place would occur, with avoidance to part of the site within and/or outside of the project corridor.
- Impact is unavoidable and the site will be totally impacted.

Of the nine archaeological sites near or within the project corridor, eight will be directly impacted by the project, though four of these will only be marginally (less than 10 per cent) impacted. Table 7-1 presents the impact assessment.

Table 7-1 Impact assessment of sites near or within the project corridor between Wells Crossing and Iluka Road

AHIMS ID	Updated name	Overall significance	New site type(s)	Impact	Description
09-4-0107	WX2I Site 7	Low	Site – Artefact scatter	Direct	Only approximately 5 per cent of WX2I Site 7 is likely to be subject to excavation to provide construction of road cutting for approximately 30 m in length. The result would be the removal of approximately 5 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.

AHIMS ID	Updated name	Overall significance	New site type(s)	Impact	Description
09-4-0106	WX2I Site 6	Low	Site – Isolated artefact	Direct	Only approximately 10 per cent of WX2I Site 6 is likely to be subject to excavation to provide construction of road cutting for approximately 60 m in length. The result would be the removal of approximately 10 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.
09-4-0105	WX2I Site 5	Low	Site – Isolated artefact	Direct	Only approximately 5 per cent of WX2I Site 5 is likely to be subject to excavation to provide construction of road cutting for approximately 60 m in length. The result would be the removal of approximately 5 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the east.
09-4-0104	WX2I Site 4	Low	Site – Artefact scatter	Direct	Only approximately 10 per cent of WX2I Site 4 is likely to be subject to excavation to provide construction of road for approximately 60 m in length. The result would be the removal of approximately 10 per cent of the site and irreversible impact to this part of its heritage values. Part of the site is within the boundary of the project but will be avoided by the construction footprint, and part of the site will be avoided and is outside the boundary of the project to the west.
09-4-0099	Tyndale 1	Low	Site – Artefact scatter	Avoid	A very small part is within the project corridor, but avoided by the construction footprint. No indirect impact is likely. Part of the site will be avoided and is outside the boundary of the project to the south west. Fencing may be required to ensure impact from associated activities is avoided.

AHIMS ID	Updated name	Overall significance	New site type(s)	Impact	Description
13-1-0115	Tyndale 2 Site	Low	Site – Artefact scatter	Direct	Tyndale 2 Site will be subject to excavation to provide construction of embanked road and culvert for approximately 170 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
13-4-0170	Shark Creek Site 2	Low	Site – Artefact scatter	Direct	Shark Creek Site 2 will be subject to excavation to provide construction of embanked road for approximately 25 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
13-1-0185	Hirst 2	Low	Site – Artefact Scatter	Direct	Hirst 2 will be subject to excavation to provide construction of road cutting for approximately 45 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.
09-1-0206	Hirst 1	Low	Site – Isolated artefact	Direct	Hirst 1 will be subject to excavation to provide construction of road cutting for approximately 25 m in length. The result would be the removal of 100 per cent of the site and irreversible impact to all its heritage value.

8. Management recommendations

A complete set of management recommendations for all identified Aboriginal cultural heritage values near and within the project corridor is presented in the CHAR, with only recommendations for archaeological sites included here (Table 8-1). Impact levels presented in Table 8-1 are reflective of the current construction footprint, in the situation of any changes to this, these management recommendations must be revisited and revised as necessary to reflect changes.

Table 8-1 Management recommendations for sites near or within the project corridor between Wells Crossing and Iluka Road

Project section	Name (AHIMS ID)	Site type	Overall Significance	Impact	Mitigation strategy/ recommendations
3	09-4-0107 WX2I Site 7	Artefact scatter	Low	5%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0106 WX2I Site 6	Artefact scatter	Low	10%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0105 WX2I Site 5	Artefact scatter	Low	5%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).
3	09-4-0104 WX2I Site 4	Artefact scatter	Low	10%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No salvage excavation is recommended. Much of this site will not be impacted by the project; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing)..
4	09-4-0099 Tyndale 1	Artefact scatter	Low	0%	**All of this site will be avoided by the project**; exclusion zones should be put in place to ensure incidental damage does not occur to these archaeological deposits. This should consist of fencing such as would exclude entry by people or plant to avoid incidental impact to the site (eg high visibility construction webbing).

Project section	Name (AHIMS ID)	Site type	Overall Significance	Impact	Mitigation strategy/ recommendations
4	13-1-0115 Tyndale 2 Site	Artefact scatter	Low	100%	• Salvage excavation must be undertaken of this site within the site extent and within the project corridor. • A total of 20 m² to be excavated by machine. This would be undertaken with a mechanical sieve and an excavator (900 mm or 1100 mm bucket). • Each excavation must be undertaken in 50 mm spits to sterile base deposits. • The location of excavations should be decided upon in the field by the archaeologist and Traditional Owners. • All artefacts which have previously been recorded and reburied during sub-surface testing must be recovered. • All cultural material recovered during salvage would be removed off-site for detailed analysis to be undertaken. Once analysed the material would be returned to the Traditional Owners for reburial or storage at a chosen location. Details of the materials nature and context should also be provided. • Cultural material recovered would be subject to detailed analysis and inclusion in a technical report.
4	13-4-0170 Shark Creek Site 2	Artefact scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.
4	13-1-0185 Hirst 2	Artefact Scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.
4	09-1-0206 Hirst 1	Artefact scatter	Low	100%	All artefacts which have previously been recorded and reburied must be recovered and removed off-site. No additional salvage excavation is recommended.

Appendix B Glossary

Aboriginal cultural heritage: The material (objects) and intangible (mythological places, dreaming stories etc) traditions and practices associated with past and present day Aboriginal communities.

Aboriginal object: Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.

Aboriginal place: Any place declared to be an Aboriginal place under s.94 of the *National Parks and Wildlife Act 1974*.

Aboriginal stakeholders: Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with the RTA to be consulted about a proposed RTA project or activity

Aeolian: Aeolian processes refer to the wind's alteration of the landscape.

AFG: An acronym for 'Aboriginal focus group'. This refers to organised meetings where Aboriginal stakeholders (who have registered their interest) can be consulted on RTA projects.

Agate: A form of banded chalcedony; it is characterised by layers of different colours.

AHIMS: Acronym for **'**Aboriginal heritage information management system'. AHIMS is a register that contains information about NSW Aboriginal heritage, and it is maintained by DECCW.

Alignment: The general route (eg of a roadway) in plan and elevation.

Alluvium: A deposit left by the flow of water. It can include sediments of gravel, mud or sand.

Angular fragment: A flaked piece of stone that does not have characteristic features which allow for it to be positively identified as a flake, core or tool.

Archaeological site: A location that has evidence of past Aboriginal activity (both material and mythological/ritual).

Archaeology: The scientific study of human history, with focus on material remains and ethnographic evidence.

Area of archaeological sensitivity: A part of the landscape that contains demonstrated occurrences of cultural material. The precise level of sensitivity will depend on the density and significance of the material.

Artefact: An item of cultural material created by humans.

Artefact scatter: Where two or more stone artefacts are found within an area of potential archaeological deposit or a site.

Axial termination: When the force from the strike used to detach a flake from the core travels all the way through the core.

Backed blade: Bladelets that have one edge blunted by steep retouch to form a back.

Basalt: A common volcanic rock. It is fine grained (approximately 45-50 per cent silica) and rich in iron and magnesium.

Bedrock: A consolidated rock that is unbroken and un-weathered, located beneath soil or rock fragments.

Bifacial flaking: The removal of flakes from two faces of a single platform.

Bipolar: A method of flaking stone, especially quartz, where cores are rested upon an anvil during flaking.

Bipolar core: A core used to create bipolar flakes.

Blade: A stone flake that is at least twice as long as it is wide.

Bioturbation: Disturbance in soil profiles caused by living organisms, such as ants and roots.

Bora ground: These are usually identified as flat, mounded earth rings that were used for Aboriginal ceremonial activities.

Bulb of percussion: A partial cone of force produced when a flake is struck off a core. The cone occurs on the ventral (inside surface) of the flake.

Burials: Burial sites may be composed of a single burial, or cemeteries containing many individuals.

Carved trees: Carved trees exhibit evidence of purposeful removal of bark, but differ from scarred trees in that geometric patterns and figures are cut into the tree. The motifs of the mid-north coast region are mostly linear geometric patterns (Craib and Bonhomme 1995: 27).

Chalcedony: A mineral with high silica content that has a microcrystalline structure. It is often described as ‘waxy’ and can be translucent. It is found in a variety of colours such as white, grey, greyish-blue or brown.

Chert: A fine grained rock composed of cryptocrystalline silica. It exhibits a range of textures and colours including red, green or black. Chert is easy to work and retains a sharp edge for an extensive period of time before resharpening is required. It has a low to medium fracture toughness.

Clast: A broken fragment of rock or crystal particle that was created either through erosion or weathering.

Clay: A type of sediment with particles less than 4 microns in size and that is composed of clay minerals (Keary 2001: 49).

Conglomerate: Is a geological term used to describe clasts that are cemented in a fine grained matrix. It is a sedimentary rock.

Core: A stone piece from which a flake has been removed by percussion (striking it) or by pressure. It is identified by the presence of flake scars showing the negative attributes of flakes, from where flakes have been removed.

Cortical platform: This term is used to describe a platform that has cortex present and may indicate that the core’s surface (where the flake was struck) was previously un-worked.

Cortex: The outer weathered surface of stone; if smooth, it can indicate the source of stone was a pebble.

Crenation: Refers to a flaked artefact's vitrified surface appearance. This appearance is caused by heat exposure and materialises as relatively uniform patterns.

Cretaceous: A geological period that dates from approximately 145 to 65 million years ago in the Mesozoic era.

Crushed platform: This term is used to describe a flake that has a damaged platform and where the platform's attributes cannot be recorded as a result.

Cultural heritage assessment report: A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to DECCW for any Part 6 *National Parks and Wildlife Act 1974* approval or prepared for projects under Part 3A of the *Environmental Planning and Assessment Act 1979* where Aboriginal cultural heritage is identified as a key issue.

Debitage: Small, unmodified flakes produced as part of the flaking process, but discarded unused.

Distal: Term of view used to describe the lower portion of a flake in respect to where the striking force terminates.

Distal flake: A broken flake with the presence of a termination and the absence of a platform or impact point.

Dolerite: A medium to fine grained volcanic rock that is the chemical and mineral equivalent of basalt.

Dorsal: The side of a flake that was originally part of the core's outer surface (often referred to as the 'dorsal surface').

Easting: This is a measurement used to determine location. The easting is the x-coordinate and relates to the vertical lines on a map, which divide east to west. It increases in size when moving further east.

Ecotone: A term used to describe the transition area between two land systems.

Edge damage: Where the edge of a tool has been used, resulting in microscopic fractures along the surface.

Exposure: The level of ground exposure is based on the whether the landform is eroding, aggrading or stable.

Faceted platform: A faceted platform has three or more flake scars present on its surface.

Feather termination: A feather termination has a 'minimal thickness at the distal end and an acute angle between the dorsal and ventral surfaces' (Crabtree 1972: 64; Holdaway and Stern 2008: 129). In appearance, a feather termination becomes gradually thinner towards the end of the flake.

Fine grained siliceous material: A rock that has a high content of silica and that is fine grained in appearance without any further identifying characteristics.

Flake: A stone piece removed from a core by percussion (striking it) or by pressure. It is identified by the presence of a striking platform and bulb of percussion, not usually found on a naturally shattered stone.

Flake scar: Often called a ‘negative flake scar’, it is the remnant of a previous flake that was struck from the core. This appears on the dorsal surface of a flake.

Flaked fragment: This is a chipped stone artefact which cannot be classed as a flake, core or retouched flake, the reason being that the defining attributes are missing. This often happens when a core contains a number of incipient fracture planes. Artefacts that are heavily weathered or which have been shattered in a fire are also difficult to categorise.

Flaked platform: This term is used to describe a platform that has been worked previously; one or more flakes were removed prior.

Floodplain: The area covered by water during a major flood and/or the area of alluvium deposits laid down during past floods.

Fluvial: Pertaining to or produced from a river.

Focalised platform: A small platform that is intentionally prepared for percussion by overhang removal.

Footprint: The scale, extent or mark that a development makes on the land in relation to its surroundings.

Geometric microliths: Backed at one end, the other end or both, these tools are made on geometric shaped flakes, <80 mm maximum dimension.

Geomorphic: Relating to the structure, shape and development of landforms.

Greywacke: A term used to describe a form of immature sedimentary sandstone with clay content.

Hammerstone: A piece of stone used to knock flakes from a core. Evidence of pitting or bashing can usually be seen along some part of the margins of this artefact.

Hinge termination: A hinge termination occurs when “the fracture meets the surface of the core at approximately right angles to the longitudinal axis of the flake” (Holdaway and Stern 2008: 130). This can present as a rounded surface that curves downwards at the distal end of a flake.

Holocene: The Holocene epoch forms part of the late Quaternary period and extends from about 11,000 years ago to the present day.

Hornfels: Metamorphosed aphanitic sedimentary rock with extremely small particle size. Formed by high-temperature metamorphism of shale and has flaking qualities.

Humic: Soil that contains organic matter (from ‘humus’).

Igneous: After magma or lava cools and solidifies, it forms igneous rock. This can happen in volcanic and plutonic (under the surface of the earth) scenarios. An example of this is basalt.

***In situ*:** A description of any cultural material that lies undisturbed in its original point of deposition.

Ironstone: A type of sedimentary rock that contains iron.

Jurassic: A geological period that dates from approximately to 200 to 145 million years ago in the Mesozoic era.

Knapping: The removal of flakes and flaked pieces from a stone core by the use of percussion.

Layer: In stratigraphy, it is used to describe a horizon (soil, rock, charcoal) that is distinct from its surrounds.

Land system: Description for an area of land based on an assessment of a series of environmental characteristics including geology, geomorphology, climate, soils and vegetation.

Loam: Soil that contains roughly equal concentrations of silt, sand and clay.

Longitudinally split flake: This is a flake that is broken (split) from the point of percussion (the strike) through to the termination.

Manuport: An unmodified piece of stone transported to a site by humans.

Mechanical trench: This refers to a trench that is excavated for archaeological purposes with a mechanical excavator. Machine excavation allows for a greater sample size to be studied in PADs of low to moderate sensitivity. Due to the large amounts of soil produced from a mechanical excavator, the soil is sieved mechanically.

Medial: Term of view referring to the intermediate section or middle section of a broken flake.

Medial flake: Absence of proximal and distal margins, but with an identifiable ventral surface.

Mesozoic: Refers to a geological era that included three periods, two of which were the Jurassic and Cretaceous. The Mesozoic era spanned from approximately 245 to 65 million years ago.

Metamorphism: The process where an existing rock (which can be sedimentary or igneous) is transformed into another mineral through the application of temperature and pressure. An example of this is hornfels.

Micron: A micron is also known as a micrometre. It is a unit of length and has the symbol ‘µm’. In metres, it is 1.0×10^{-6} metre or 0.000001 metre.

Midden: The term midden is a Danish word meaning a mound of kitchen refuse. In archaeological terms, a midden refers to an accumulation of shell deposited after people had collected and eaten shellfish. These could contain estuarine and fresh water shellfish species in addition to faunal remains, stone artefacts and charcoal from cooking fires. In northern NSW in many areas, burials have been recorded in direct association with midden deposits.

Mudstone: A sedimentary rock formed from mud/clay.

Muller: A large stone artefact which differs in construction depending on the environment. These were used as an aide for processing seeds and other low return plant material or ochre.

Multi-platform core: Is a core with more than one identifiable platform.

Munsell colour: This is a colour code chart used to standardise colour specifications.

Natural/mythological sites: These may not exhibit any physical or archaeological evidence, but their identification is derived from local Aboriginal tradition and oral history. These sites often have

mythological associations and are associated with ceremonial activity in the past. These sites are sometimes prominent landmarks, such as mountains, rivers, rocky outcrops, and headlands (eg Glenugie Peak, the Clarence and Richmond Rivers).

Non-diagnostic: An amorphous piece of stone that is neither a flake, flaked fragment, core or retouched flake.

Northing: This is a measurement used to determine location. The northing is the y-coordinate and relates to the horizontal lines on a map, which divide north to south. It increases in size when moving further north.

Notched tool: Flakes that exhibit a small area of retouch, forming a concave edge on lateral or distal margin.

Oriented length: This is a measurement taken from the point of impact through to the termination.

Oriented thickness: This is a measurement taken from where the oriented width and oriented length intersect.

Oriented width: This is a measurement taken across the middle of a flake (halfway between the point of impact and the termination).

Overhang removal: This occurs when a platform is prepared for striking; small flakes are struck before a flake is detached, leaving visible scars behind.

Potential Archaeological Deposit (PAD): A PAD is a location that is considered to have a potential for sub-surface cultural material. This is determined from a visual inspection of the site, background research of the area and the landform's cultural importance.

pH: A measure of the acidity or alkalinity of the soil. Neutral is indicated by a pH of 7, with strongly acidic being 0 and strongly basic (alkaline) being 14. The 'pH' is said to stand for 'potential of hydrogen'.

Platform: On a flake, this is a core remnant from where the flake was struck off the core.

Platform width: This is a measurement taken across the width of a platform between the two lateral margins of a flake.

Platform thickness: This is a measurement taken from the ventral to dorsal surfaces of a flake (beginning at the point of impact/percussion).

Pleistocene: The Pleistocene is an epoch within the early Quaternary period, extending from about 1.6 million years ago to about 11,700 years ago. The end of the Pleistocene is marked by the last of the great ice ages.

Plunge termination: This occurs when the ventral surface "curves markedly away from the face of a core...and continues directly into the core, removing the base of the core" (Holdaway and Stern 2008: 132). This can present as a 'J' shape when holding the flake in profile.

Proximal: Term of view used to describe the upper portion of a flake in respect from where it was initially struck off a core.

Proximal flake: A broken flake with the presence of a platform, but the absence of a termination.

Pot-lidded: The damage caused by exposure to extreme heat, resulting in a circular depression on the surface of a stone artefact.

Pressure flaking: A process to remove a flake from a core by applying pressure (from a piece of wood or bone) along the core's edge.

Quarry: In this report, 'quarry' can refer to a native source of stone that was mined by Aboriginal people in the past. Rock from these sites could be used to make artefacts.

Quartz: A mineral composed of silica with an irregular fracture pattern. The quartz used in artefact manufacture is generally semi-translucent, although it varies from milky white to glassy. Glassy quartz can be used for conchoidal flaking, but poorer quality material is more commonly used for block fracturing techniques. Quartz can be derived from water worn pebbles, crystalline or vein (terrestrial) sources.

Quartzite: A form of metamorphosed sandstone. It is often white or grey in colour, but can occur in other shades due to mineral impurities.

Quaternary: This is a geological time period spanning approximately 2 million years (to the present). It includes the two epochs, the Pleistocene and the Holocene.

Refit: Knapping is a reductive technology. As such, it is possible to 'refit' tools back together after breakage or knapping (ie refitting a proximal and distal flake back together or refitting a flake back to the core it was knapped from).

Rejuvenation: This is done to prepare a new platform on a core so that more flakes can be removed. Flakes struck for this purpose are called 'rejuvenation flakes'.

Resource zone: An area of the landscape or part of the environment that provides a resource (be it food or material items such as a source of stone for making artefacts) for Aboriginal people. Swamps are good examples of rich resource zones.

Retouch: A flake, flaked piece or core with intentional secondary flaking along one or more edges.

Ridge straightening: This is a "flake that has a clearly identifiable dorsal ridge and is characterised by alternating flake removals down its dorsal surface" (Holdaway and Stern 2008: 150).

Sand: A material composed of small grains (0.625-2.0 milimetres) (Keary 2001: 233). Sand is formed from a variety of minerals and rocks, but commonly contains silica, such as quartz.

Sandstone: Is a sedimentary rock formed from sand-sized grains.

Scarred trees: Trees that feature Aboriginal derived scars are distinct due to the scar's oval or symmetrical shape and the occasional use of steel, or more rarely, stone axe marks on the scar's surface. Scarred trees are identified by the purposeful removal of bark for use in the manufacture of artefacts such as containers, shields and canoes. The bark was also used for the construction of shelters. Other types of scarring include toeholds cut in the trunks or branches of trees for climbing purposes and the removal of bark to indicate the presence of burials in the area.

Sediment: Is a mineral that has undergone erosion or weathering and that is then deposited via aeolian, glacial or fluvial means.

Sedimentary: Sedimentary rock is formed through the accumulation of sediment deposits that are then consolidated. An example of this is mudstone.

Shale: A sedimentary rock of well-defined layers comprised of small particles (less than 4 microns in size) (Keary 2001: 16) sourced from weathered or eroded materials.

Significant ground disturbance: Means disturbance of (a) the topsoil or surface rock layer of the ground; or (b) a waterway, by machinery in the course of grading, excavating, digging, dredging or deep ripping, but does not include ploughing other than deep ripping.

Silt: A sediment with grains ranging from 4.0-62.5 microns in size (Keary 2001: 245). It can be found as a soil or in water.

Single platform core: Is a core with one identifiable platform.

Scraper: A stone tool, usually with steep retouch along its edges that was ethnographically used to make wooden implements or process foods and other resources.

Silcrete: Soil, clay or sand sediments that have silicified under basalt through groundwater percolation. It ranges in texture from very fine grained to coarse grained. At one extreme it is cryptocrystalline with very few clasts. It generally has characteristic yellow streaks of titanium oxide that occur within a grey and less commonly reddish background. Used for flaked stone artefacts.

Slate: A metamorphosed mudstone**.**

Spit: Refers to an arbitrarily defined strata of soil removed during excavation (often 50 millimetres to 100 millimetres in depth).

Step termination: This occurs when a “flake terminates abruptly in a right-angle break” (Holdaway and Stern 2008: 130).

Stone arrangements: On the mid-north coast of NSW, stone arrangements usually consist of cairns and/or alignments of rocks. These features are considered by Gumbaynggir people as having ceremonial significance and are often found in relatively high and/or inaccessible places such as mountain peaks and coastal headlands.

STP: Acronym for ‘shovel test pit’. Generally, this refers to a 0.5 metre x 0.5 metre pit dug by shovel, trowel or mattock. STPs are usually laid out on a grid pattern and the soil is excavated from the pit in a controlled manner, using 50-100 mm spits. After the pits are photographed, recorded and mapped, they are then backfilled.

Stratification: The way in which soil forms in layers.

Stratigraphy: The study of soil stratification (layers) and deposition.

Sub-surface testing: An archaeological method used to determine the cultural sensitivity of an area by excavating small (0.5 metre x 0.5 metre) pits and recording the stratigraphy, material remains (such as stone tools) and disturbance.

Survey: In archaeological terms, this refers to walking over a surface while studying the location of artefacts and landmarks. These are then recorded and photographed.

Termination: Refers to the shape of the distal end of a flake.

Tool: A stone flake that has undergone secondary flaking or retouch.

TP: Acronym for ‘test pit’. Generally, this refers to a 1 metre x 1 metre or 2 metre x 1 metre pit dug by shovel, trowel or mattock. Test pits were used to determine the extent of possible features (such as shell middens) in a controlled excavation of 50 millimetre spits.

Usewear: A pattern of wear that is left on a stone artefact due to utilisation.

Ventral: The side of a flake that was originally attached to the core (often called the ‘ventral surface’). Features such as the bulb of percussion are found on this surface of a flake.

Visibility: Refers to the degree to which the surface of the ground can be observed. This may be influenced by natural processes such as wind erosion or the character of the native vegetation, and by land use practices, such as ploughing or grading. It is generally expressed in terms of the percentage of the ground surface visible for an observer on foot.

Waterholes/wells: Waterholes or wells can be any natural or excavated water retaining feature of either historic or prehistoric significance. In order to be considered as an archaeological site, there should be some evidence of modification or use of the site.

Appendix C Director-General requirements

NSW GOVERNMENT | Planning & Infrastructure

Contact: Lisa Chan
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Email: lisa.chan@planning.nsw.gov.au

Our ref: 11/713604-2

Mr Bob Higgins
General Manager Pacific Highway
Roads and Maritime Services
21 Prince Street
GRAFTON NSW 2460

Dear Mr Higgins

Environmental Assessment Requirements for the Pacific Highway Upgrade – Woolgoolga to Ballina Project (SSI – 4963)

The Department has reviewed your request for the Director-General's environmental assessment requirements (DGRs) for the preparation of an Environmental Impact Statement for the above State Significant Infrastructure project.

I have attached a copy of the DGRs which have been prepared in consultation with relevant government authorities. I have also attached a copy of the government authorities' comments for your information. The DGRs are based on the information you have provided to date. Please note that under section 115Y(4) of the *Environmental Planning and Assessment Act 1979*, the Director-General may modify these requirements at any time.

With regard to the key issue of heritage, the research design and methodologies proposed for any physical archaeological works to be undertaken as part of the initial heritage assessments for the project should be reviewed by both the Department and the Office of Environment and Heritage in relation to Aboriginal Heritage, and the Heritage Council of NSW regarding non Aboriginal Heritage, prior to the commencement of physical disturbance of the site. This will ensure that the strategies being used are appropriate and in accordance with standard archaeological practices.

Prior to exhibiting your EIS, the Department will review the document to determine if it adequately addresses the DGRs. The Department may consult with other relevant public authorities in making this decision. If the Department considers that the EIS does not satisfactorily address the DGRs, you may be required to submit an amended EIS. Once the Department is satisfied that the requirements have been addressed, you will be contacted regarding arrangements for public exhibition.

Finally, if your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Department of Sustainability, Environment, Water, Population and Communities to determine if an approval under the EPBC Act is required for your project (http://www.environment.gov.au or 6274 1111).

Your contact officer for this project, Ms Lisa Chan, can be contacted on (02) 9228 6226 or via email at lisa.chan@planning.nsw.gov.au. Please mark all correspondence regarding the project to the attention of the contact officer.

Yours sincerely

23.11.11

Chris Wilson
Executive Director
Major Projects Assessment
As delegate for the Director General

Environmental Assessment Requirements

Section 115Y of the *Environmental Planning and Assessment Act 1979*

Application number	SSI - 4963
Infrastructure (project)	**Pacific Highway Upgrade – Woolgoolga to Ballina** - the construction and operation of approximately 155 kilometres of four-lane divided carriageway, from approximately 5 kilometres north of Woolgoolga to approximately 6 kilometres south of Ballina. The project does not include the upgrades at Glenugie and Devils Pulpit, located between Woolgoolga and Ballina.
Location	Land generally located: (i) from Arrawarra Beach Road approximately 5 kilometres north of Woolgoolga to approximately 21 kilometres south of Grafton (the Franklins Road intersection with the Pacific Highway), and (ii) from approximately 13 kilometres south of Grafton (the Eight Mile Lane intersection with the Pacific Highway) to approximately 66 kilometres north of Grafton, and (iii) from approximately 72 kilometres north of Grafton to the Ballina Bypass approximately 6 kilometres south of Ballina, in the Ballina, Clarence Valley, Coffs Harbour and Richmond Valley local government areas.
Proponent	Roads and Maritime Services
Date issued	23 November 2011
General requirements	The Environmental Impact Statement (EIS) must be prepared in accordance with and meet the minimum requirements of Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation) and include the following: 1. the information required under clause 6 of Schedule 2 of the Regulation; and 2. the content listed in clause 7 of Schedule 2 of the Regulation, including but not limited to: o a summary of the environmental impact statement, o a statement of the objectives of the project, including a description of the strategic need, justification, objectives and outcomes for the Pacific Highway Upgrade Program, the aims and objectives of relevant strategic planning and transport policies, including *NSW 2021*, the *Far North Coast Regional Strategy* and the *Mid North Coast Regional Strategy*, and the cumulative and synergistic impacts associated with the Pacific Highway Upgrade Program as a whole, and o an analysis of feasible alternatives to the carrying out of the project and project justification, including: ➢ an analysis of alternatives/ options considered, having regard to the project objectives (including an assessment of the environmental costs and benefits of the project relative to alternatives and the consequences of not carrying out the project), and the provision of a clear discussion of the route development and selection process, the suitability of the chosen alignment and whether or not the project is in the public interest, and ➢ justification for the preferred project taking into consideration the objects of the *Environmental Planning and Assessment Act 1979*.

	○ an analysis of the project, including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with clause 7(1)(d) of Schedule 2 of the Regulation (where relevant), including an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing management/ mitigation measures, and ○ detail how the principles of ecologically sustainable development will be incorporated in the design, construction and ongoing operation phases of the project.
Key issues	The EIS must address the following specific matters: **Traffic and Transport** – including but not limited to: • demonstration of how the preferred route and road design meets the traffic and transport objectives of the project; • construction traffic impacts, including: ○ the identification of routes and the nature of existing traffic on these routes, ○ an assessment of construction traffic volumes (including spoil haulage/ delivery of materials and equipment to the road corridor and ancillary facilities), and ○ potential impacts to the regional and local road network (including safety and level of service) and potential disruption to existing public transport/ school bus services and access to properties and businesses; • operational traffic and transport impacts to the local and regional road network, including: ○ changes to access arrangements/ service roads to properties, businesses and State forest road network, ○ changes to local road connectivity and impacts on local traffic arrangements, road capacity/ safety, service roads and modified access to the upgraded highway (including potential impacts of changed traffic arrangements on public transport/ school bus services and access for emergency services), ○ traffic capacity of the project and its ability to cater for predicted future growth. Consideration should be given to what effect potential major land use changes in the locality may have on the traffic assessment outcomes, and ○ opportunities for the provision of pedestrian and cycle access and connections along the highway and to adjoining communities; and • impacts on maritime use of the Richmond and Clarence rivers and safety of navigation for water based traffic. **Biodiversity -** including but not limited to: • impacts on the biodiversity values of the site and adjoining areas, including flora and fauna and their habitat (terrestrial, riparian and aquatic); • impacts on Endangered Ecological Communities, critical habitat, threatened and protected species, populations and their habitats, listed under both State and Commonwealth legislation that have been recorded or considered likely to occur on the site and surrounding land based on the presence of suitable habitat, and whether the proposal or specific aspects of the proposal constitute Key Threatening Processes in terms of the *Threatened Species Conservation Act 1995*; • targeted surveys of threatened flora and fauna species and their habitat that are known or likely to occur within the project's study area based on the presence of suitable habitat. The targeted surveys must include but not limited to the following species:

	○ Oxleyan Pygmy Perch (*Nannoperca oxleyana*), Purple Spotted Gudgeon (Mogurnda adspersa), ○ Squirrel Glider, Yellow-bellied Glider, Brush-tailed Phascogale, Eastern Pygmy-possum, ○ Wallum Froglet, Olongburra Frog, Pouched Frog, Giant-barred Frog, Green-thighed Frog, Green and Golden Bell Frog, ○ White-crowned Snake, Pale Headed Snake, Stephen's Banded Snake, ○ Microbats – all threatened species, ○ Forest Owls – Masked, Sooty, Barking, Powerful, Grass Owl, ○ Brolga, Black-necked Stork, Comb-crested Jacana, Magpie Goose, Black Bittern, ○ Bush Stone – curlew, Albert's Lyrebird, Grey-crowned Babbler, ○ Koala, Long-nosed Potoroo, Common Planigale, Rufous Bettong, and ○ Emu (*Dromaius novaehollandiae*). Details of the survey methodology employed, including survey effort and timing and representativeness for the species targeted, should be identified; • impacts on wildlife and habitat corridors, and habitat fragmentation and details of mitigation measures, having regard to the range of fauna species and opportunities for connectivity (terrestrial, arboreal and aquatic) across the project; • impacts on/from vegetation loss, weed infestation (terrestrial and aquatic), edge effects, groundwater dependent ecosystems, wetlands including State Environmental Planning Policy No. 14 – Coastal Wetlands, and aquatic and riparian species and their habitats; • consideration of regional scale cumulative impacts and the significance of the biodiversity impacts of the project in the context of the Pacific Highway Upgrade Program; • details of how impacts would be managed during construction and operation for project components (including ancillary facilities), the suitability of measures and adaptive management and maintenance protocols and monitoring programs; • the details of available offset measures to compensate the biodiversity impacts of the proposal where offset measures are proposed to address residual impacts, consistent with the *Principles for the use of biodiversity offsets in NSW*; and • taking into account the *Draft Guidelines for Threatened Species Assessment* (Department of Environment and Conservation, 2005); *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians* (DECCW, 2009); and *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft* (DEC, 2004). **Noise and Vibration –** including but not limited to: • construction noise and vibration impacts, including impacts from construction traffic, ancillary facilities, batch plants and blasting. The EIS must identify sensitive receivers and assess construction noise/ vibration generated by representative construction scenarios focusing on high noise generating works. Where work hours outside of standard construction hours are proposed, clear justification and detailed assessment of these work hours must be provided, including alternatives considered, mitigation measures proposed and details of construction practices, work methods, compound design, etc; • cumulative impacts during construction, having regard to other developments (both existing and approved) in the locality, the staged construction of the project and the construction of adjoining Pacific Highway Upgrade projects;

	• operational road traffic noise impacts of the project (including service roads and rest areas) on sensitive receivers, including reflective noise impacts from proposed noise mitigation barriers and bridges; and
	• taking into account the following guidelines, as relevant: *NSW Road Noise Policy* (Department of Environment, Climate Change and Water, 2011), *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009), *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006), and *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment and Conservation Council, 1990).
	
	Soils, Sediments and Water – including but not limited to:
	• impacts on surface water flows, quality and quantity, with particular reference to any likely impacts on surrounding water bodies, wetlands and their habitats, including potential indirect impacts on the Solitary Island Marine Park by works in the Arrawarra Creek and Corindi River catchments;
	• groundwater impacts, taking into consideration local impacts at deep cuttings and fill locations, and cumulative impacts on regional hydrology. The assessment shall consider: the extent of drawdown, impacts to groundwater characteristics, quality, quantity, and connectivity, discharge and recharge rates, and implications for surface flows, groundwater users, groundwater dependent ecosystems and wetlands;
	• impacts to the Rous Water Regional Water Supply (Woodburn) bore fields drinking water source, taking into account discharge/ recharge rates and groundwater yield, and consideration of the relevant public health and environmental water quality criteria specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* ((Australian and New Zealand Environment and Conservation Council) and the *Australian Drinking Water Guidelines 2004* (National Health and Medical Research Council and the Natural Resource Management Ministerial Council);
	• flooding impacts and characteristics, to and from the project, with an assessment of the potential changes to flooding behaviour (levels, velocities and direction) and impacts on bed and bank stability, through flood modelling, including:
	  ◦ hydraulic modelling for a range of flood events,
	  ◦ description, justification and assessment of design objectives (including bridge, culvert and embankment design),
	  ◦ an assessment of afflux and flood duration (inundation period) on land, infrastructure, property and business operations (including agricultural land and stock movement to flood refuges and evacuation routes), hazard and emergency service within the affected area, and future development potential of access affected land, and
	  ◦ consideration of the effects of sea level rise, changes to rainfall frequency and/or intensity as a result of climate change, including an assessment of the capacity of proposed (and existing) stormwater drainage structures;
	• waterways to be modified as a result of the project, including ecological, hydrological and geomorphic impacts (as relevant), including temporary crossings, and measures to rehabilitate the waterways to pre-construction conditions or better, including fish passage requirements consistent with *Policy and Guidelines for Fish Friendly Waterway Crossings* (Department of Primary Industries, 2004);
	• identification and assessment of soil characteristics and properties that may impact or be impacted by the proposal; and
	• identification and assessment of soft soils, soil contamination, acid

	sulfate soils, and details of erosion and sedimentation control measures. **Heritage –** including but not limited to: • impacts to *Aboriginal heritage* (including cultural and archaeological significance), in particular impacts to Aboriginal heritage sites identified within or near the project should be assessed. Where impacts are identified, the assessment shall: o outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation, 2005), o be undertaken by a suitably qualified heritage consultant(s), o demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures), and o develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations of the areas of PAD identified in a manner that establishes the full spatial extent and significance of any archaeological evidence across each area of PAD, and include the results of these excavations; and • impacts to *State and local historic heritage* (including archaeology, heritage items conservation areas and natural areas), in particular impacts to the New Italy Settlement and High Conservation Value Old Growth Forest should be assessed. Where impacts to State or locally significant historic heritage items are identified, the assessment shall: o outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the guidelines in the NSW Heritage Manual (1996), o be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria), o include a statement of heritage impact for all heritage items (including significance assessment), o consider impacts from vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment, and o develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations and include the results of these excavations. **Visual Amenity, Urban Design and Landscaping** – including but not limited to: • a description of the visual significance of the affected landscape, particularly where the corridor traverses greenfield areas; • an assessment of the visual impact of the project on the landscape character of the area, including built form (materials and finishes) and the urban design (height, bulk and scale) of key components including bridge crossings, floodplain embankments, interchanges, and views to and from the project; and • details of landscaping treatment and design (including noise barriers, retaining walls and landscaping) consistent with the overall design of the Pacific Highway Upgrade Program and integration with the existing (and desired) character of affected localities;

	• taking into account the *Noise Wall Design Guideline* (Roads and Traffic Authority, 2006). **Land Use and Property -** including but not limited to: • impacts on directly affected properties and land uses, including impacts related to access, land use, property infrastructure, future development potential, property acquisition and land sterilisation and severance; • the agricultural sector taking into account fragmentation and potential loss of regionally significant farmland as identified in the *Northern Rivers Farmland Protection Project* (Department of Planning, 2005) and *Mid North Coast Farmland Mapping Project* (Department of Planning, 2008), food production, stock/ agricultural diseases and the impact on quarantined properties of a revised road network, and impacts on travelling stock routes/ reserves (as relevant); • the operation of State forest estate, including potential for fragmentation and sterilisation of resources, and access by forestry and other users; • impacts on Crown land, reserves and assets, and land reserved under the *National Parks and Wildlife Act 1974*; • impacts on natural resources, including mining, petroleum production and extractive resources utilisation; • impacts on commercial fishing access and aquaculture operations, including impacts on oyster priority areas in accordance with the *NSW Oyster Industry Sustainable Aquaculture Strategy 2006* (Department of Primary Industries); and • identification of services and utilities to be relocated. **Social and Economic -** including but not limited to: • social and economic impacts on local and regional communities (including towns and villages directly impacted by the project and those bypassed by the project); • impact on highway-based businesses and agribusinesses from traffic, access, property, public domain and amenity related changes; • impact of the project on tourist and recreational access and use of towns and villages, National Parks and nature reserves, State forests and waterways; and • connectivity (including pedestrian and cycleway opportunities) and contiguity of existing and planned settlement and activity clusters. **Environmental Risk Analysis –** notwithstanding the above key assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the EIS.

Consultation	You should undertake an appropriate and justified level of consultation with relevant parties during the preparation of the EIS, including but not limited to:
	• local, State and Commonwealth government authorities, including the:
	  ○ Department of Primary Industries (Agriculture, Forests, Fisheries, Minerals and Crown Land divisions),
	  ○ Heritage Council of NSW,
	  ○ Marine Parks Authority NSW,
	  ○ Maritime Services,
	  ○ NSW Office of Water,
	  ○ Office of Environment and Heritage,
	  ○ Transport for NSW, and
	  ○ Ballina, Clarence Valley, Coffs Harbour and Richmond Valley

	councils; • specialist interest groups, including Local Aboriginal Councils, Aboriginal stakeholders and industry/ growers associations, mining and petroleum title holders; • utilities and service providers, including Rous Water; and • the public, including community groups and adjoining and affected landowners. The EIS must describe the consultation process, document consultation undertaken and identify the issues raised (including where these have been addressed in the EIS).
Further Consultation after 2 years	If you do not lodge an EIS for the development within 2 years of the issue date of these DGRs, you must consult with the Director General in relation to the preparation of the EIS.