Appendix C - Aboriginal cultural heritage due diligence assessment

Eastern Gas Pipeline – Port Kembla Lateral Modification

Aboriginal Cultural Heritage Due Diligence Assessment

FINAL REPORT

Prepared for Jemena

25 March 2020

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Document information

Report to:	Jemena
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Biosis project no.:	31411

File name: 31411.PortKembla.JemenaLoop.ADDA.DFT00.20200120

Citation: Biosis (2020). Jemena Eastern Gas Pipeline – Port Kembla Lateral Modification. Report for Jemena. Authors: S Keats and M Tetlaw Biosis Pty Ltd, Wollongong. Project no. 31411

Document control

Version	Internal reviewer	Date issued
Draft version 01	Elizabeth Wyatt	23/01/20
Final version 01	Samantha Keats	03/02/2020
Final version 02	Samantha Keats	23/03/2020

Acknowledgements

Biosis gratefully acknowledges the contributions of the following people and organisations (listed alphabetically) in preparing this report:

- Client: Tim Vesey, Jemena.

Biosis staff involved in this project were:

- Anne Murray for mapping.

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Glossary

ADDA	Aboriginal Due Diligence Assessment
AHIMS	Aboriginal Heritage Information Management System
Due diligence code	*Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*
EGP	Eastern Gas Pipeline
EP&A Act	*Environmental Planning and Assessment Act 1979*
GSV	Ground Surface Visibility
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
EES	NSW Environment, Energy and Science Group
PAD	Potential Archaeological Deposit
Study area	SP76828, Lot 1 DP 606430, Lot 2 DP 569201, Lot 2 DP 609232, Lot 2 DP 792692,Lot 2 DP 1237278, Lot 13 and Lot 14 DP 1126042, Lot 30 and Lot 31 DP 241455, Lot 48 DP 261816, Lot 104 DP 617569, Lot 127 DP 817646, and Lot 210 DP 811435
The Code	The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*

Summary

Biosis Pty Ltd has been commissioned by Jemena to undertake an Aboriginal Cultural Heritage Due Diligence Assessment (ADDA) for the proposed the Eastern Gas Pipeline (EGP) Port Kembla lateral modification between Kembla Grange and Cringila, New South Wales (NSW) (the project). The project is an extension to the eastern gas pipeline which extends from Sydney to Melbourne.

The study area is located within the Wollongong Local Government Area (LGA) and extends from Cringila in a westerly direction through the suburbs of Unanderra, Berkeley and Kembla Grange. The study area is bounded by Five Islands Road and Princess Highway to the north, Princess Motorway and Nolan Street to the south, Wyllie Road to the east and Five Islands Road to the west.

An archaeological investigation of the study area was undertaken on 17 and 21 January 2019 by Samantha Keats, Consultant Archaeologist.

The survey revealed that most of the study area had been subject to extensive ground disturbances due to the initial vegetation clearing, construction of industrial buildings and infrastructure, and the modification of the landscape by the deposition of coal slag and fill and construction of a road and rail corridor with associated services. No Aboriginal objects or areas of PAD were identified during the survey.

Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area assessed as having low archaeological potential.

Recommendation 2: Discovery of Unanticipated Aboriginal Objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the NSW Environment, Energy and Science (EES). Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the EES and Aboriginal stakeholders.

Recommendation 3: Discovery of Aboriginal Ancestral Remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify the NSW Police and EES' Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by EES

1 Introduction

1.1 Project background

Biosis Pty Ltd has been commissioned by Jemena to undertake an ADDA for the proposed the EGP Port Kembla lateral modification between Kembla Grange and Cringila, NSW (the project). The project is an extension to the eastern gas pipeline which extends from Sydney to Melbourne.

An assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a) has been undertaken for the study area in order to inform responsibilities with regards to Aboriginal cultural heritage in the area. In addition to the basic tasks required for a due diligence assessment, an extended background review, as well as an archaeological survey in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) (the Code) was conducted, in order adequately map areas of high, moderate and low archaeological sensitivity.

1.2 Location of the study area

The study area is located within the Wollongong LGA, Parishes of Kembla and Wollongong both in the county of Camden. The study area (Figure 1) extends from Cringila in a westerly direction through the suburbs of Unanderra, Berkeley and Kembla Grange. The study area is bounded by Five Islands Road and Princess Highway to the north, Princess Motorway and Nolan Street to the south, Wyllie Road to the east and Five Islands Road to the west (refer to Figure 2).

1.3 Planning approvals

The proposed development will be assessed against Part 5 of the *Environmental Planning and Assessment Act 1979* NSW (EP&A Act). Other relevant legislation and planning instruments that will inform the assessment include:

- *National Parks and Wildlife Act 1974* (NSW) (NPW Act).
- *National Parks and Wildlife Amendment Act 2010* (NSW).
- *Wollongong Local Environmental Plan 2011* (LEP).

1.4 Scope of the assessment

The following is a summary of the major objectives of the assessment:

- Conduct background research in order to recognise any identifiable trends in site distribution and location, including a search of the Aboriginal Heritage Information Management System (AHIMS).
- Undertake archaeological survey as per requirement 5 of the code, with particular focus on landforms with high potential for heritage places within the study area, as identified through background research.
- Record and assess sites identified during the survey in compliance with the guidelines endorsed by EES.
- Determine levels of archaeological and cultural significance of the study area.

- Make recommendations to mitigate and manage any cultural heritage values identified within the study area.

1.5 Aboriginal consultation

Paul Cummins from the Illawarra Local Aboriginal Land Council (LALC) accompanied Biosis Consultant Archaeologist Samantha Keats on a survey of the study area.

1.6 Proposed development

The proposed modification would include:

- Construction and installation of an 18 to 22 inch diameter carbon steel gas pipeline 5.6 kilometres in length.
- Connection to the Port Kembla Gas Terminal at AIE's proposed Cringila facility.
- Tie-in facility at Kembla Grange, connecting the proposed pipeline to the existing EGP.

The proposed pipeline would be installed using a combination of open trenching and horizontal directional drilling (HDD) techniques, with approximately 1.8 kilometres being installed using HDD. The construction footprint will comprise of a 20 metres wide pipeline construction Right of Way, which will accommodate plant, equipment and lay down areas (Figure 3). The operational easement will vary depending on location, but will generally be between 6 metres and 10 metres. The new pipeline will be located within or adjacent to the existing easement.

The proposed pipeline alignment will also predominantly follow the route of the Port Kembla lateral except for four areas where the route has to deviate due to insufficient room within the existing easement or due to industrial development having taken place along the pipeline easement since the original line was installed. The total length of these four areas is approximately 1.6 kilometres. The existing Port Kembla Lateral was constructed in a similar 20 metre Right of Way approximately 15 years ago and the operational easement varies between 6 and 10m metres wide. The new looping pipeline will be co-located or immediately adjacent to the existing easement, and will be buried to a similar depth of the existing of 1.2 metres.

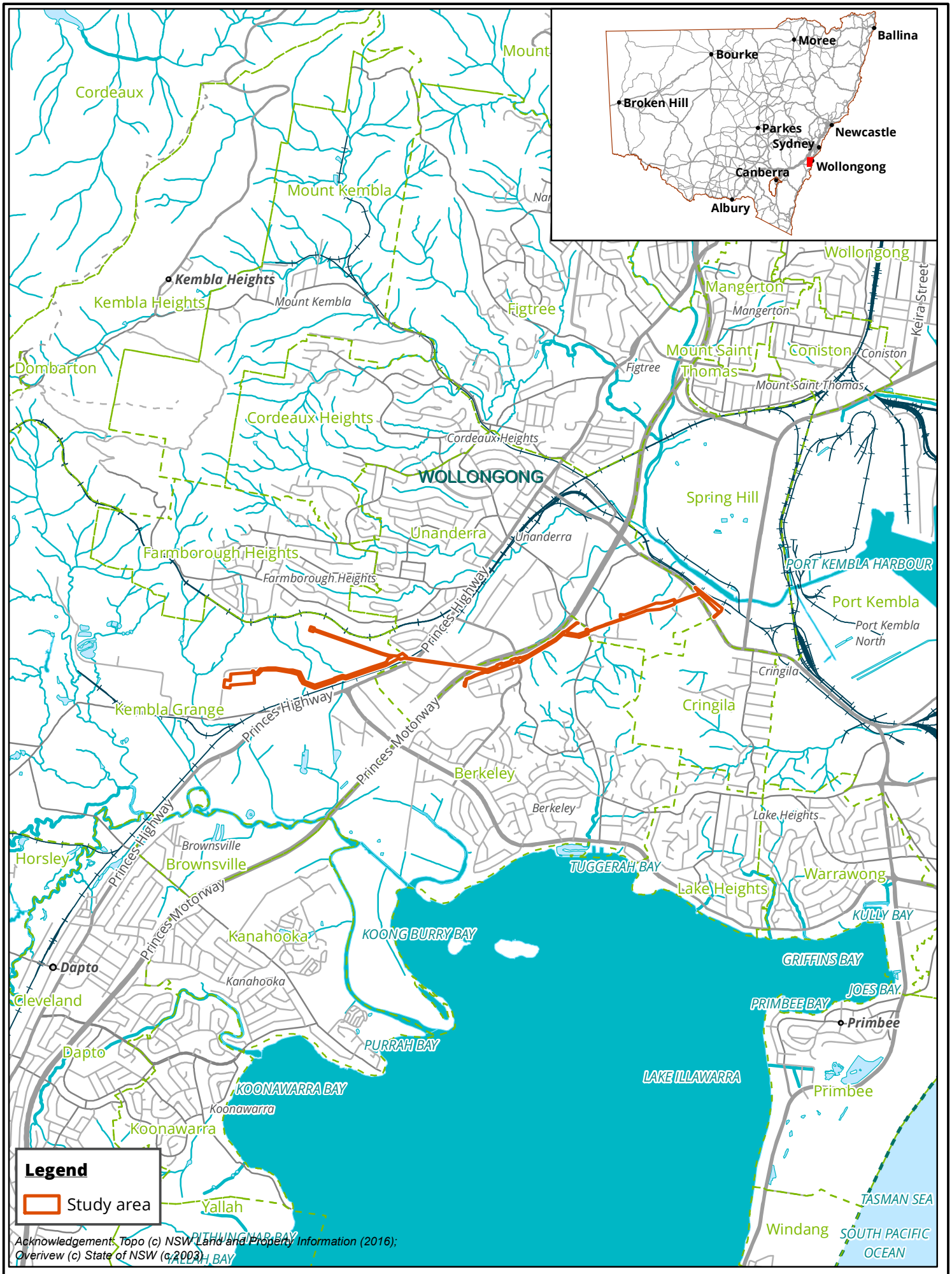

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Figure 1 Location of the study area

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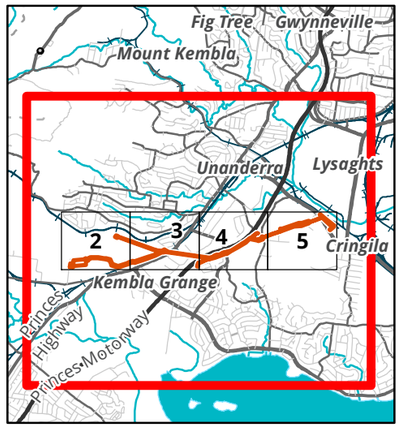

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Study area

Figure 2.1 Study area detail

0 250 500 750 1,000

Metres

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Coordinate System: GDA 1994 MGA Zone 56

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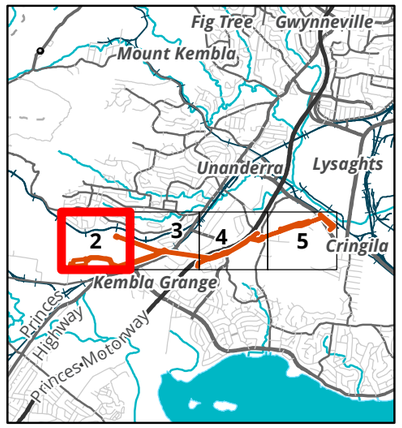

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Study area

Lot

Figure 2.2 Study area detail

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

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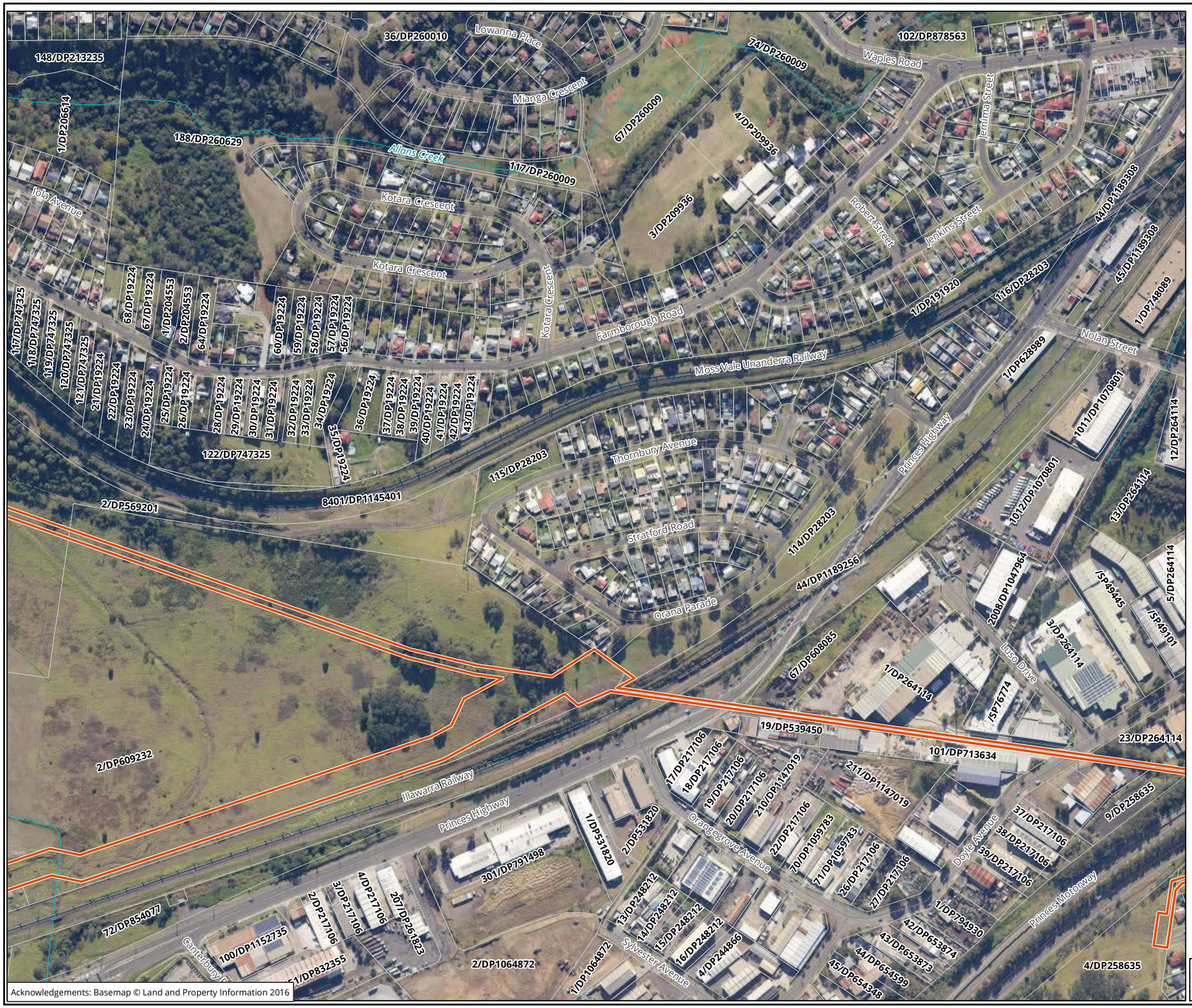

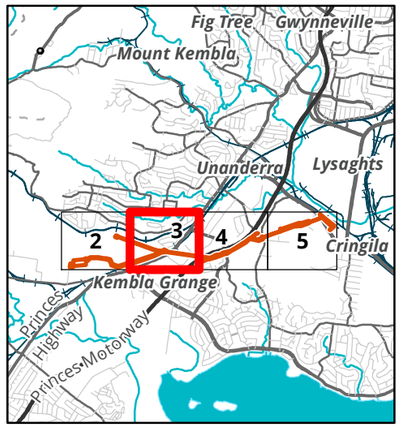

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- Study area
- Lot

Figure 2.3 Study area detail

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Metres

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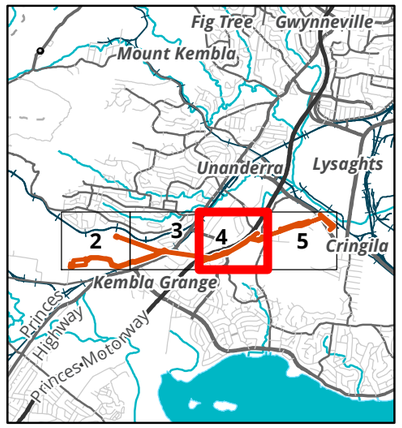

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Study area

Lot

Figure 2.4 Study area detail

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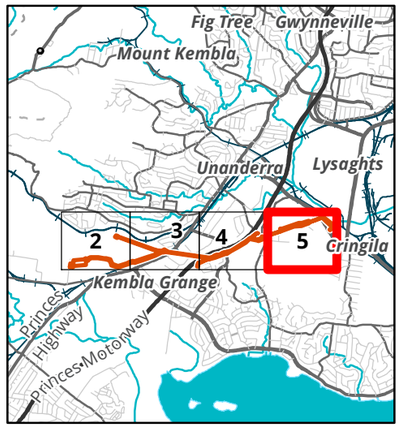

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- Study area
- Lot

Figure 2.5 Study area detail

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Metres

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Legend

- Study area
- Proposed pipeline
- Proposed easement - HDD
- Proposed easement - Open trenching
- Soil stripping
- Proposed laydown area

Figure 3.1 Proposed development

0 250 500 750 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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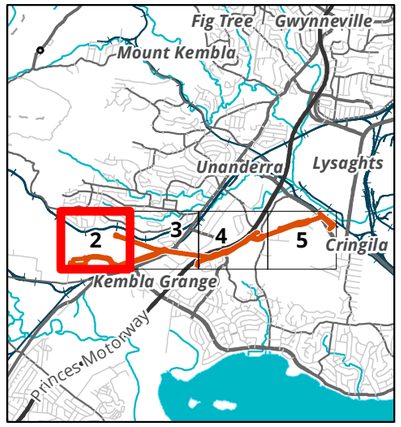

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- Study area
- Proposed pipeline
- Proposed easement - Open trenching
- Soil stripping
- Proposed laydown area

Figure 3.2 Proposed development

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

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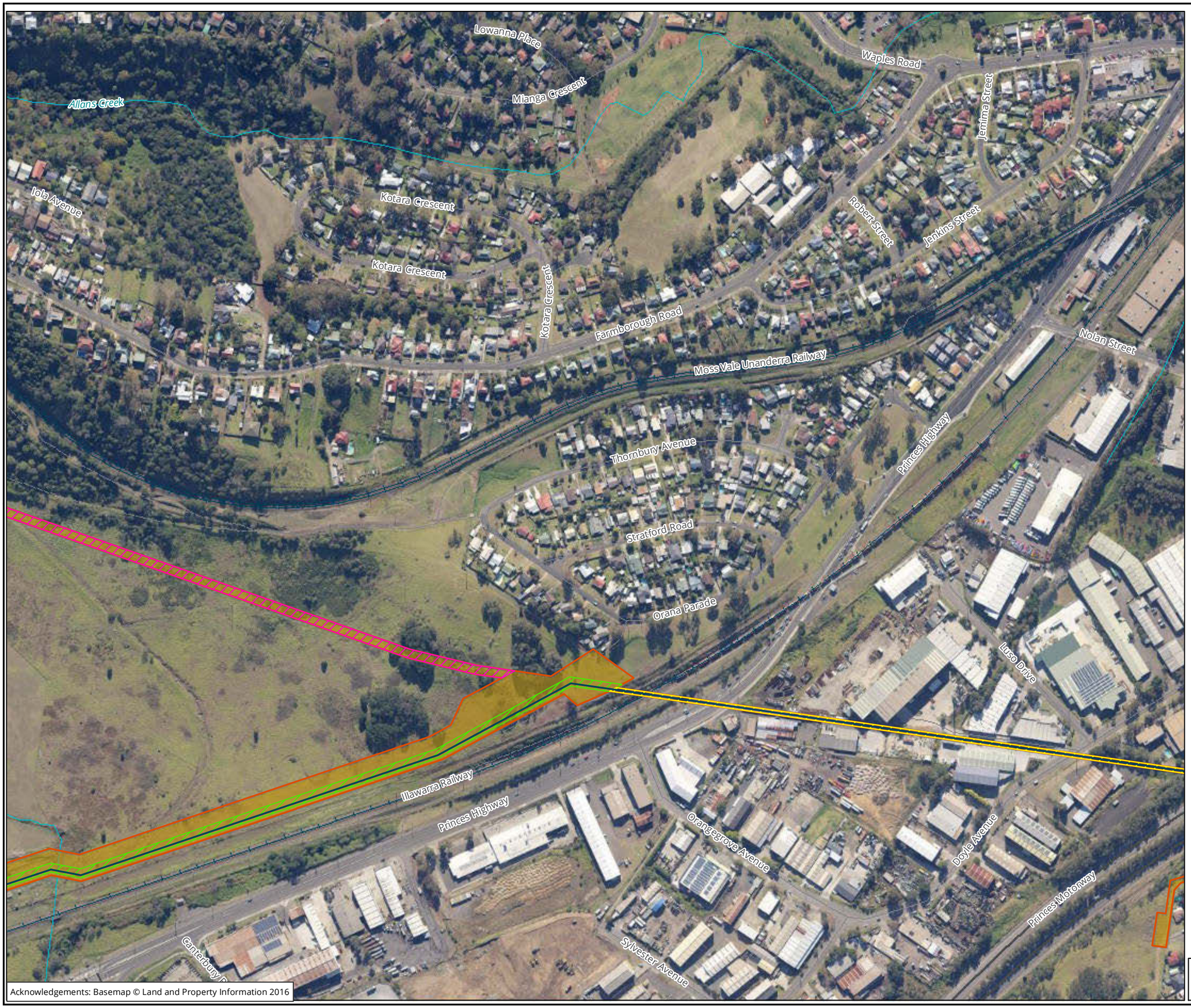

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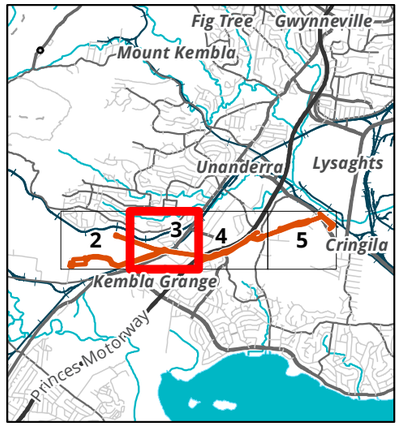

Legend

- Study area
- Proposed pipeline
- Proposed easement - HDD
- Proposed easement - Open trenching
- Soil stripping
- Proposed laydown area

Figure 3.3 Proposed development

0 50 100 150 200

Metres

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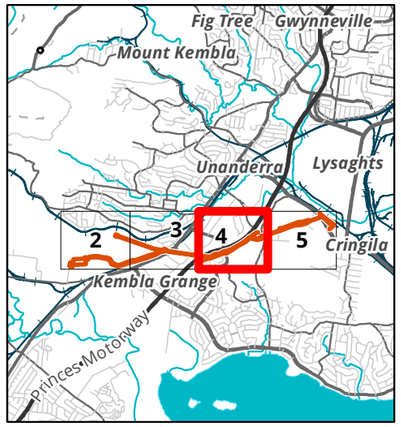

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- Study area
- Proposed pipeline
- Proposed easement - HDD
- Proposed easement - Open trenching
- Proposed laydown area

Figure 3.4 Proposed development

0 50 100 150 200

Metres

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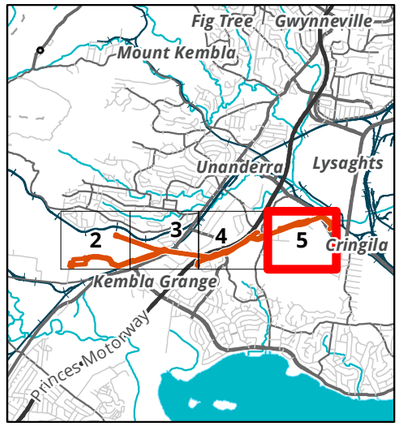

Legend

- Study area
- Proposed pipeline
- Proposed easement - HDD
- Proposed easement - Open trenching
- Proposed laydown area

Figure 3.5 Proposed development

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

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2 Desktop assessment

A brief desktop assessment has been undertaken to review existing archaeological studies for the study area and surrounding region. This information has been synthesised to develop some Aboriginal site predictive statements for the study area and identify known Aboriginal sites and/or places recorded in the study area. This desktop assessment has been prepared in accordance with requirements 1 to 4 of the code.

2.1 Landscape context

The study area is located in the undulating plains to steep foothills on the Illawarra escarpment and Wollongong coastal Plain. These overlying physiogeographic units are characterised as a mosaic of foothills, ridges, spurs, hillocks and floodplains with slopes varying from very gently inclined to steep with the occasional low cliff. The Coastal Plain is dissected by easterly flowing streams at intervals that become more frequent towards the north (Fuller 1982, pp. 18). The underlying geology comprises the Illawarra Coal Measures of Permian age (299-251 million years ago) and more recent quaternary deposits closer to the escarpment. Most of this area has been disturbed by modern urban and industrial developments (Figure 4).

The topographic profile of the study area itself consists of moderately steep upper slopes and mid slopes in the western portion. The centre of the study area is defined by lower slopes and flats, while the eastern portion is situated on moderately steep mid slopes.

Several drainage lines and creek lines are associated with the study area. In the western portion of the study area, two unnamed drainage lines intersect the study area and Gibson's Creek is located one kilometre to the south. In the eastern portion, three drainage lines intersect the study area, while Allans Creek is directly adjacent to the study area. In all cases, these watercourses have been altered from their natural positions due to modern developments.

2.2 Geology, soils and landforms

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. They are defined by a combination of soils, topography, vegetation and weathering conditions. Soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

The study area is located within the disturbed, Gwynneville and Fairy Meadow soil landscapes (Figure 5).

2.2.1 The disturbed soil landscape

The disturbed soil landscape is defined by the overwhelming presence of unnatural depositional features and is the result of disturbance by human activity to a depth of approximately 100 centimetres. In these cases, the original soil has been either removed, disturbed or buried. Most of this area has been levelled to slopes of <5% and original vegetation has been completely cleared (Hazelton & Tille 1990, pp. 104).

The geology is now defined as artificial fill comprising dredged sands, rocks and other materials. Also Included is demolition rubble, industrial and household waste. Landfill deposits include building and waste material alongside natural rock and soil. Land use in this soil landscape is varied, including those of commercial and industrial needs as well as sporting or recreational features. Within quarries such as Port Kembla, bedrock is exposed. The disturbed soil landscape is present within the centre portion of the study area.

2.2.2 Gwynneville soil landscape

The Gwynneville soil landscape is situated on the foot slopes of the Illawarra escarpment and isolated rises of the Wollongong Plain. The Gwynneville soil landscape includes broad to moderately rounded ridges and gently to steeply include slopes. Undulating and steep hills are also present, as are inclined foot slopes and isolated rises on the coastal plain. The local relief is 10-70 metres and slopes are between 3-25% (Hazelton & Tille 1990, pp. 38). Typical Gwynneville soil characteristics are detailed in Table 1. Lithosols are shallow young soils that lack stratified deposits and defined horizons. They are not fully developed or are weakly developed soils. Lithosols usually consist of mineral or organic surface horizon (Horizon A – topsoil). Soils are shallow and erosion and mass movement can occur, which will cause the displacement of any potential Aboriginal sites downslope. Land use is predominantly urban residential while dairy production occurs on improved pastures.

Table 1 Gwynneville soil landscape characteristics (Hazelton & Tille 1990, pp. 38)

Soil material	Description
Gw1 – Friable brown sandy loam	Comprises moderate pedal sandy loam to loam with rough-faced peds. These peds range from 1-10 millimetres from crumb to polyhedral. Colour varies from brownish black (7.5YR 2/2) to dull yellowish brown (10YR 5/3). pH levels range from 7 to 6. This material also consists of rare sandstone gravels and cobbles (<2-20%) measuring between 6-600 millimetres. Roots are rare. This material occurs as top soil and the organic matter content is high.
Gw2 – Friable sandy clay loam	Moderately pedal sandy clay loam with rough-faced peds with size ranging from 2-10 millimetres. Colour varies from brownish black (10YR 3/2) to dull yellowish brown (10YR 5/3). pH is 6.5. This soil context includes sandstone fragment and gravel pieces (10-90% inclusion) and their size ranges from 2-600 millimetres. This material occurs as topsoil or subsoil.
Gw3 – Brown pedal clay	Moderately pedal, light to heavy clay with rough-faced peds. Texture increases from light to heavy clay with depth. Ped sizes range from 5-20 millimetres and are polyhedral or blocky in shape. Colour varies from brown (7.5YR 4/6) to dull yellowish brown (10YR 5/4). Occasionally, orange mottles are present at depth. pH ranges from 5-6.5. Gravel and rock includes are common. Roots are absent. This material occurs as subsoil.

2.2.3 Fairy Meadow soil landscape

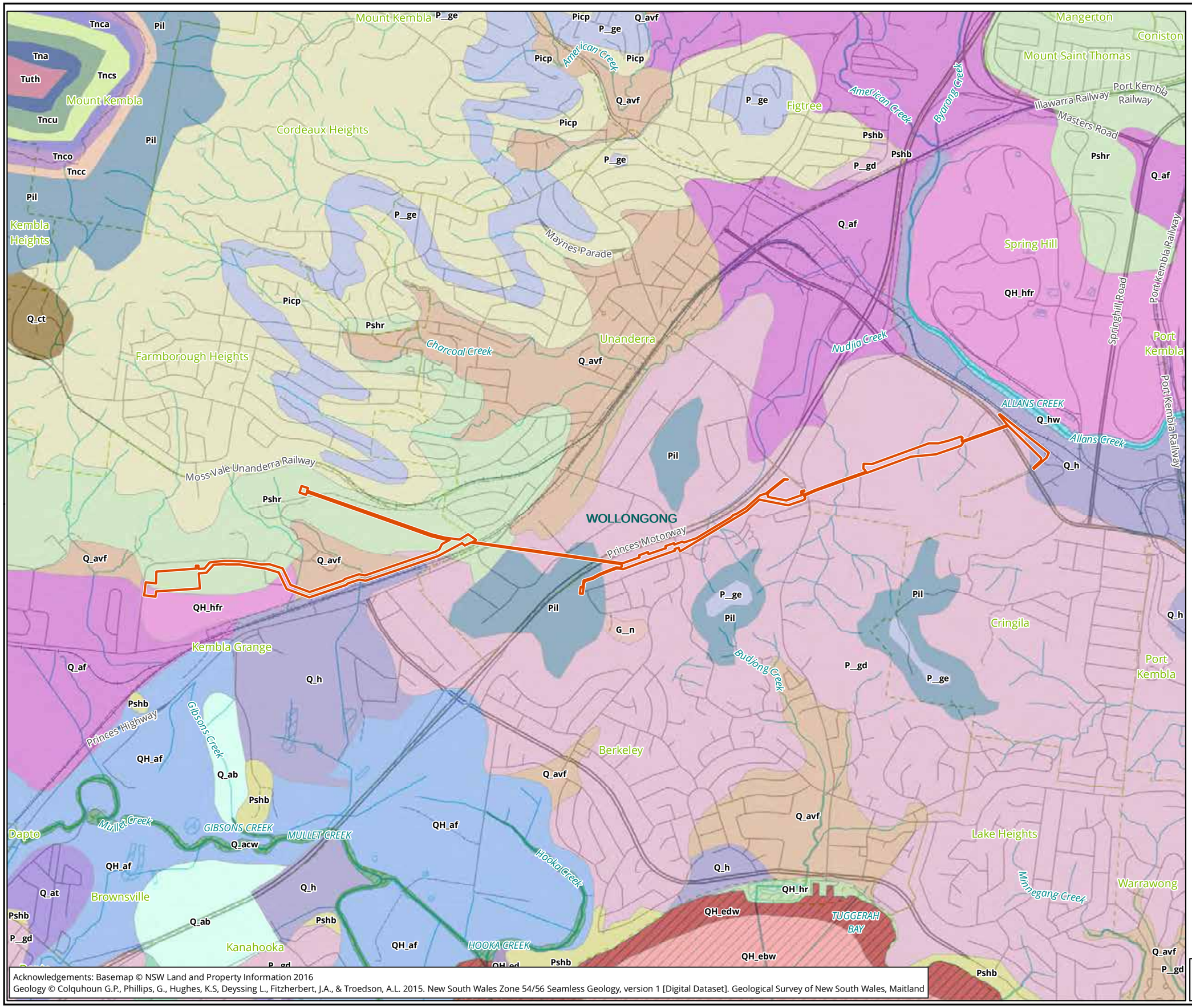
The Fairy Meadow soil landscape is defined by alluvial plains, floodplains, valley flats and terraces below the Illawarra escarpment (Hazelton & Tille 1990, pp. 100). This landscape is almost completely cleared of original low forest and woodland environments. The topography is gently undulating alluvial plains with floodplain, valley flats and minor terracing throughout. Slopes are >5% and the local relief is >20 metres.

Fairy Meadow Soil landscape is classified as a swamp landscape that is characterised by soils that are at least seasonally wet, with water tables frequently close to the surface (Hazelton & Tille 1990, p.100). There is minor sheet erosion, gully erosion and stream bank erosion in relevant areas throughout the landscape. Parent soil material includes large amounts of accumulated decayed organic matter. Since they accumulate parent soils and deposit transported soils, swamp soil landscapes would preserve archaeological material. Use of this landscape is comprised of commercial, industrial and residential developments.

Table 2 Fairy Meadown soil landscape characteristics (Hazelton & Tille 1990, pp. 100)

Soil material	Description
Fa1 – Brownish black loose sandy loam	Comprises apedal massive sandy loam to loamy sand. The colour of these soils is brownish black (10YR 2/2). PH levels are 7 to 7.5. In some areas of the landscape stones 2-20 millimetre in size constitute 10% of the volume of the material. This material occurs as top soil.
Fa2 – brown sand	Apedal single-grained sandy loam with porous sandy fabric. Colour varies from brown (7.5YR 4/4) to dull brown (7.5YR 6/3). PH is 7 to 6. Occasional orange mottles occur at depth. Roots are rare. This material occurs as subsoil.
Fa3 – Yellowish brown sand	Moderately pedal light clay to sandy clay loam with rough-faced peds measuring between 5-20 millimetres in size. Colour of these soils range from brown (7.5YR 4/3) to dull yellowish brown (10YR 4/3). Occasional orange and red mottles occur at depth. Small to medium grounded gravels make up 50% of this material. Roots are rare. The pH is 6. This material occurs as subsoil.
Fa4 – Olive brown clay	Weakly pedal heavy clay with rough—faced peds. These peds are approximately 2-20 millimetres in size. Their colour ranges from olive brown (2.5YR 4/3) to yellowish brown (10YR 4/3). Occasionally, orange and red mottles occur at depth. Localised gravels (<20mm) may take up 50% of the material. Roots are rare. This material occurs as subsoil.

The presence of erosion in both the Fairy Meadow and Gwynneville soil landscape may suggest the presence of Aboriginal artefacts within the study area, with erosion occurring on crests and hills that could cause artefacts to be deposited on hill slopes. The sandy loam that defines the majority of the study area may be the result of older dunes and valley systems, which are good for preserving artefacts. However, there is a low to nil chance of artefacts being present in the disturbed landscapes closer to Port Kembla.



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Legend

Study area

Geological Units

- G__n - Nolan Dolerite
- P__gd - Dapto Latite Member
- P__ge - Berkeley Latite Member
- Picp - Pheasants Nest Formation
- Pil - Illawarra Coal Measures
- Pshb - Berry Siltstone
- Pshr - Broughton Formation
- Q_ab - Alluvial backswamp deposits
- Q_acw - Alluvial channel deposits-
- Q_af - Alluvial floodplain deposits
- Q_at - Alluvial terrace deposits
- Q_av - Alluvial valley deposits
- Q_avf - Alluvial fan deposits
- Q_ct - Colluvial talus deposits
- Q_h - Anthropogenic deposits
- Q_hw - Anthropogenic stored water,
- QH_af - Alluvial floodplain deposits
- QH_ebw - Estuarine basin and bay (subaqueous)
- QH_ed - Estuarine- fluvial delta front
- QH_edw - Estuarine- fluvial delta front (subaqueous)
- QH_hfr - Anthropogenic deposits-Fill on Quaternary deposits
- QH_hr - Anthropogenic deposits-Reclaimed estuarine areas
- Tna - Narrabeen Group
- Tnca - Scarborough Sandstone
- Tncc - Coal Cliff Sandstone
- Tnco - Wombarra Claystone
- Tncs - Stanwell Park Claystone
- Tncu - Bulgo Sandstone
- Tuth - Hawkesbury Sandstone

Figure 4 Geological units in the vicinity of the study area

0 200 400 600 800 1,000

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Albury, Ballarat, Melbourne,
Sydney, Newcastle, Wangaratta & Wollongong

Matter: 31411,
Date: 15 January 2020,
Checked by: SJK, Drawn by: AEDM, Last edited by: amurray
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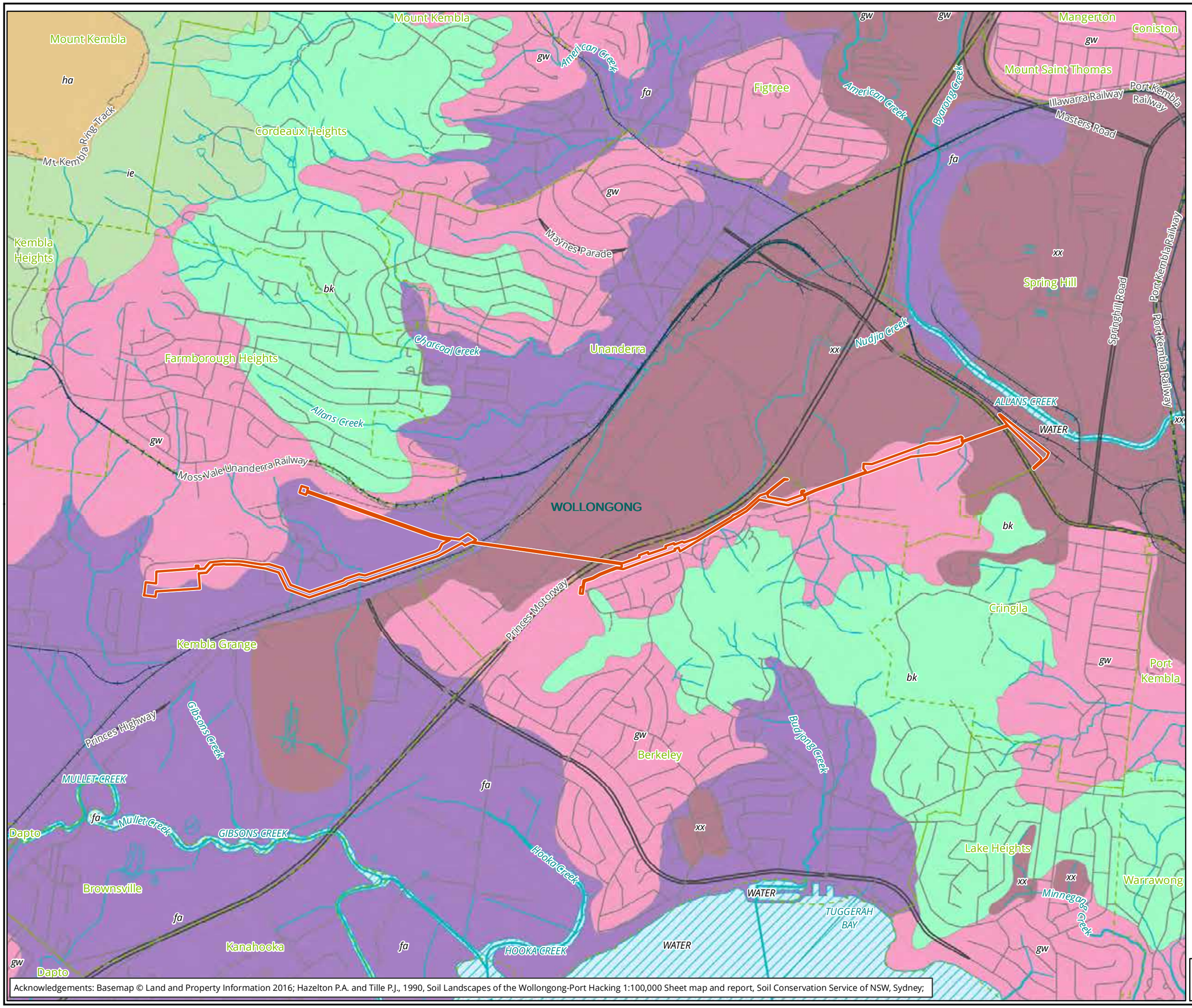

Acknowledgements: Basemap © Land and Property Information 2016; Hazelton P.A. and Tille P.J., 1990, Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney;

Legend

Study area

Soil Landscape units

- bk - BERKELEY
- fa - FAIRY MEADOW
- gw - GWYNNEVILLE
- ha - HAWKESBURY
- ie - ILLAWARRA ESCARPMENT
- WATER - WATER
- xx - DISTURBED TERRAIN

Figure 5 Soil landscapes in the vicinity of the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Albury, Ballarat, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

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2.3 Flora and fauna

The margins of the Wollongong Plains are characterised by mixed warm temperate and subtropical rainforest complexes on rich shale soils and alluvium under the escarpment, interspersed with patches of lowland forest and woodland communities. The study area is located within areas that have been cleared or retain pockets of disturbed native vegetation, with intact remnant vegetation situated along the creek line corridors. This surviving vegetation is defined as Coastal Grassy Red Gum Forest (New South Wales National Parks and Wildlife Service 2003). Another important landscape is Lake Illawarra, which supports many vegetation and animal species. Within the wider region, Moist Box-Red Gum Foothills Forest vegetation class is present that would have been exploited by local people. Each community class is described below with the dominant species occurring.

Coastal Grassy Red Gum Forest is characterised by the dominance of Forest red gum *Eucalyptus tereticornis* and Narrow-leaf stringybark *Eucalyptus eugenoides*. Coastal grey box *Eucalyptus bosistoana* is unique to this community. A grassy understorey and the presence of species such as Tick-trefoil *Desmodium varians*, Weeping grass *Microlaena stipoides var. stipoides*, Scurvy weed *Commelina cyanea*, Tussock *Poa labillardieri var. labillardieri*, Hedgehog grass *Echinopogon ovatus*, Paddock lovegrass *Eragrostis leptostachya*, Windmill grass *Chloris divaricata var. divaricata*, Bluegrass *Bothriochloa decipiens* and Chocolate Lily *Dichopogon strictus*.

Acacia Scrubs include a number of Acacia species that recolonised cleared or heavily disturbed native vegetation. On the foot slopes of the Escarpment where tall moist forests once existed, *Acacia mearnsii* are distinctive. Acacia scrubs also regularly occur in combination with native species such as Turpentine *Syncarpia glomulifera*.

Moist Box-Red Gum Foothills Forest is dominated by Forest red gum *Eucalyptus tereticornis*, White box *Eucalyptus quadrangulata* and occasionally Blue gum *Eucalyptus saligna X botryoides*. Shrub understoreys include Grey Myrtle *Backhousis myrtifolia* as a key species with Red olive plum *Cassine australis*, Native cascarilla *Croton verreauxii* and low densities of Whalebone tree *Streblus brunonianus*.

These vegetation communities supported a range of faunal resources that would have been utilised by Aboriginal peoples. Terrestrial and avian resources would have included Lace Monitor *Varanas varius,* Dingo *Canis lupis dingo,* Eastern Grey Kangaroo *Macropus giganteus*, ringtail possum *Pseudocheirus peregrinus*, wombat and grey ehaded flying fox *Pteropus poliocephalus* (Wesson 2009).

The vegetation communities in the study area and surrounding region would have also provided habitat for a range of fauna. This would have included wombats *Vombatus ursinus*, kangaroos, ringtail possums *Pseudocheirus peregrinus*, as well as various lizards and birds (Wesson 2009). Terrestrial and avian resources were not only used for food but also provided a significant contribution to the social and ceremonial aspects of Aboriginal life through their use as ritual implements or even simply through fashioning as personal adornments (Attenbrow 2002, pp. 107–108). Mammals such as kangaroos and arboreal mammals such as possums were used as a food source and also for tool making. Bones and teeth were used as points or barbs for hunting spears and fishing spears, while tail sinews are known to have been used as a fastening cord (Attenbrow 2002, pp. 99–100).

2.4 European land use history

The Illawarra district was first noted by James Cook in 1770 when he located the headland of Port Kembla, naming it 'Red Point' (Lindsay, Organ, & Doyle 1994, pp. 1). He also identified a large hill which looked like the crown of a hat. This was Mount Kembla, which was known as Hat Hill in the early days of the settlement (McDonald 1966, pp. 5). The next recorded Europeans to visit the Illawarra district were Bass and Flinders in 1796, who sailed along the south coast from Sydney in their small boat, the *Tom Thumb* (Lindsay, Organ, &

Doyle 1994, pp. 1). Following their landing near Tom Thumb Lagoon, they entered Lake Illawarra and made the first recorded contact with the Aboriginal people in the Illawarra (McDonald 1966, pp. 10).

The first settlement in the Illawarra region was established by Charles Throsby, who cut a cattle track from Glenfield to just behind South Beach, Wollongong, where he constructed a stockman's hut and cattle yard in 1815 (Osbourne 2000, pp. 1). Joe Wild was Throsby's stockman, and was also made constable of the district of Five Islands in 1815 (McDonald 1966, pp. 28). The following year, Surveyor-General John Oxley was sent to the Illawarra region to make a general survey of the area and to connect it to the known parts of the colony, as well as identify specific lands for prospective grantees (Osbourne 2000, pp. 1).

Although Throsby was the first settler in the Illawarra, closely followed by John Oxley, both of whom squatted illegally whilst pasturing cattle (Dowd 1977, pp. 2). The first five grants in the area were made in 1821 to absentee landlords, who ran cattle on their lands with a few stockmen present. The first five grants of land made in the Illawarra region were (Dowd 1977):

- Richard Brooks, Exmouth, 1300 acres.
- George Johnston, Macquarie Gift, 1500 acres.
- Andrew Allen, Waterloo, 700 acres.
- Robert Jenkins, Berkeley, 1000 acres.
- David Allen, Illawarra Farm, 2200 acres.

The Illawarra region was attractive not only for its rich pasture, but also for its red cedar, which was exploited by the early timber cutters (Lindsay, Organ, & Doyle 1994, pp. 4). This resulted in an influx of setters, and between the cattlemen and the cedar cutters, much of the Illawarra region was cleared of trees and vegetation during this time. Grants continued to be made in the Illawarra region following the initial five grants, comprising essentially free grants with easy terms, until August 1831, when land could only be purchased at auction. Following the gazetting of the *Crown Lands Alienation Act* (1861) any un-alienated land was taken up as Conditional Purchase holdings.

The north-east portion of the study area originally belonged to Robert and Jemima Jenkins (Merchants) as part of the Berkeley Estate. Robert was one of the first five Illawarra land grants in 1817 and Jemima would later provide an additional 2000 acres towards the estate. Primarily, the land was used for agricultural and grazing purposes. The central and Western portions of the study area were part of a land grant belonging partly to Andrew Lang and Gerrard Gerrard as exhibited on a 1906 parish map.

A review of historical aerials over the study area was undertaken to track disturbance and modification of the landscape over time. Aerial imagery from 1948 shows the eastern portion of the study area to be largely undeveloped (Plate 1. Similarly, the expansion visible in the eastern portion of the study area is also clear in the western portion with mass vegetation clearing occurring by 1948 (Plate 2). Large areas have been subject to vegetation clearing but little infrastructure or built construction is apparent. Apart from Five Islands Road, the eastern portion of study area at this time remains relatively undisturbed. Within the western portion, development at this time included some structures, such as farm houses, and the Illawarra railway line. which are contained within the study area

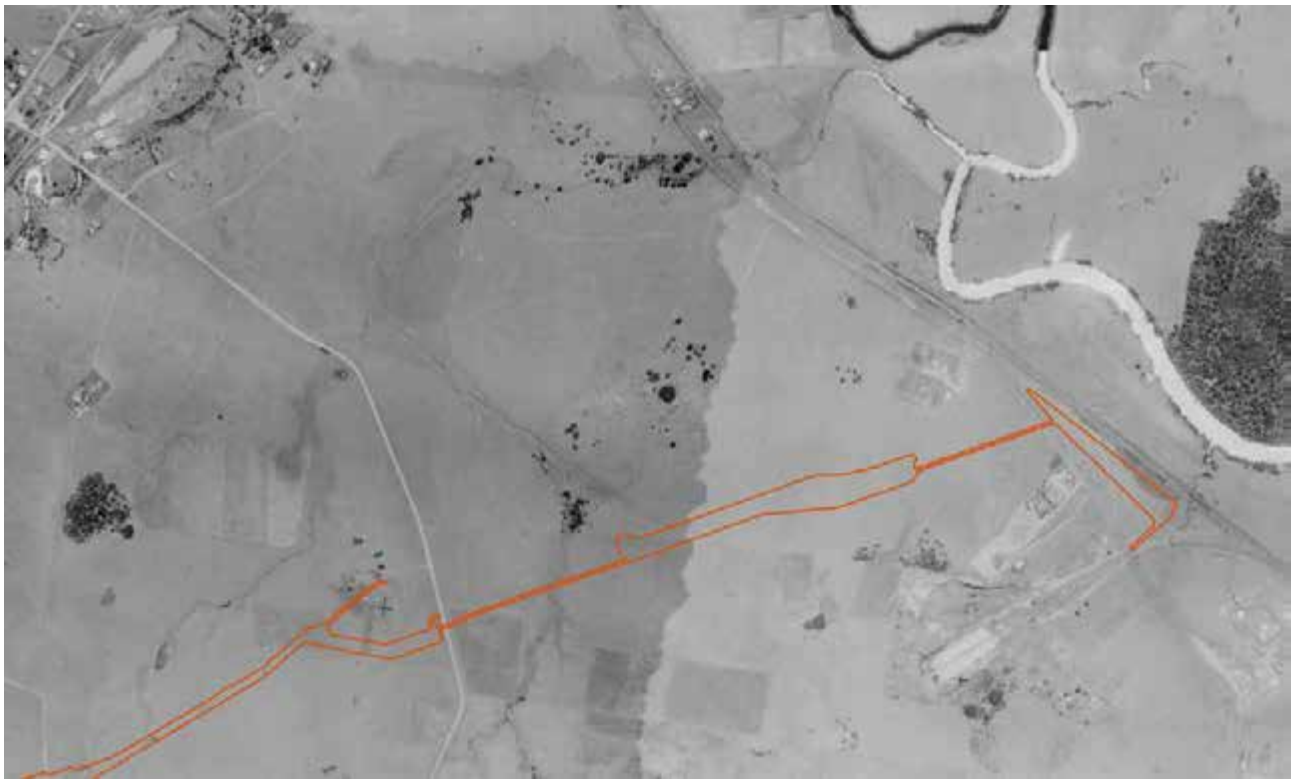


Plate 1 1948 aerial over the eastern portion of the study area (Source: Adastra Imagery 2015)

Plate 2 1948 aerial over the western portion of the study area (Source: Adastra Imagery 2015)

By 1978, aerial imagery shows major development associated with the construction of Port Kembla (Plate 3). Industrial and some residential buildings populate the landscape as extending west from Five Islands Road.

Major industrial buildings have also been constructed on the southern side of Five Islands Road. By this time, Allans Creek to the north-east of the study area has been significantly widened.

Plate 3 1978 aerial over the eastern portion of the study area (Source: BHP Air Imagery)

By 1986, the western portion of the study area has been heavily modified with the deposition of coal wash and coal slag, which resulted in the development of Wylie road (Plate 4). By this time the 1948 structures are no longer visible.

Plate 4 1986 aerial over the western portion of the study area (source: BHP Air Imagery 2019)

A 2018 aerial (Plate 5) shows that the entire study area is heavily developed owing to the industrial expansion of Port Kembla, the residential expansion at Unanderra and construction of the Pacific Motorway. Major development and infrastructure projects have taken place across the entire study area from 1948 to 2018. Within the western portion of the study area, development has been centred on mining and agriculture. Meanwhile, the centre of the study area has been a place of major commercial infrastructure development including the construction of the Pacific Motorway which intersects the study area. Finally, the eastern portion has been altered owing to the industrial expansion of Port Kembla. Significant modifications have also been undertaken at the major creek lines; Allens Creek (adjacent to the study area) and Gibsons creek (one kilometre from the study area), and no longer resemble their natural structures. Overall, the study area has experienced significance disturbance.

Plate 5 2018 aerial over the study area (source: DFSI Spatial Services 2018)

3 Aboriginal context

3.1 Ethnohistory and contact history

General acceptance of the initial occupation of the Australian land mass by first Australians is 50,000 years ago (Hiscock 2008, Dortch et al. 2019); however, this date is in constant revision (Clarkson et al. 2017). Traditional stories of the arrival of Aboriginal people to the Illawarra region begin 'in another land beyond the sea' (Organ 1990, pp. iv). Later analysis of middens has dated the region to 6000 to 7000 years on the coast and at Lake Illawarra. More broadly, it is accepted that Aboriginal occupation of the south coast dates to around 20,000 years ago (AMBS 2006, pp. 33).

Current evidence for the occupation of the Illawarra region identifies the area as belonging to the Wodi Wodi, a member of the Dharawal (elsewhere Tharawal) linguistic group (Attenbrow 2010). Attenbrow argues the Dharawal boundaries were on the south side of Botany Bay extending as far as Shoalhaven river and Appin with perhaps a boundary extending as far as Camden (Attenbrow 2010, pp. 34). Within this area Tindale's (1974) research identifies eight named groups including: Gweagal, Norongerraga, Illawarra, Threawal, Tagary, Wandeandega, Wodi Wodi and Ory-ang-ora. Similar research by Donlon and Sefton (1988) recognised high levels of mobility between these groups around the Illawarra region. These language groups and their associated boundaries were not static entities. Instead, changes over time were based on environmental and cultural contexts (i.e. cultural contact and sea level change).

Lake Illawarra, located four kilometres from the study area, presents both a place of abundant resource acquisition and stories associated with habitation in the area. Traditional stories tell of the arrival of people to the region "at the mouth of lake Illawarra in canoes when the Ancestors were animals " (Wesson 2009, pp. 5). Additional stories are also associated with the animals of the region. The Brolga *Grus rubicundus*, aided in the construction of Gun-man-gang, the island at the entrance to Lake Ilawarra (Wesson 2009, pp. 38). Meanwhile, the koala *Phascolarctus cinereus* helped guide inhabitants of the region to the mouth of the Shoalhaven river (Wesson 2009, pp. 104).

3.2 Regional context

A number of Aboriginal cultural heritage investigations have been conducted for the Illawarra region. Models for predicting the location and type of Aboriginal sites with a general applicability to the Lake Illawarra region and thus relevant to the study area have also been formulated, some as a part of these investigations and others from cultural heritage investigations for relatively large developments.

Sefton (1990) completed an archaeological survey for West Dapto Stage One Release Area in 1990, located south of Bong Bong Road. The survey targeted areas previously identified as having high archaeological potential, i.e. all level areas within 100 metres of a creek situated on Quaternary deposits (floodplains) and/or Budgong Sandstone, and areas with remnant mature native vegetation. Three new Aboriginal sites were identified: two scarred trees; Bong Bong 1 (AHIMS 52-2-1542) and Bong Bong 3 (52-2-1543), and an artefact scatter; Bong Bong 2 (AHIMS 52-2-1544). The two scarred trees consist of Forest Red Gum *Eucalyptus tereticornis* and Narrow-leaf Stringybark *Eucalyptus eugenoides*. Two stone artefacts associated with Bong Bong 2 were located in an erosion gully above a cow track, approximately 2 metres from Reid Creek. Sefton concluded that the alluvium of the Robins Creek floodplains would contain significant stratified archaeological deposits. However, floodplains associated with the Mullet Creek tributary, derived from Budgong Sandstone, would have been waterlogged and sites were unlikely to be present below alluvial deposits.

Navin Officer (1993) completed archaeological testing of a proposed residential subdivision on the southern side of Bong Bong Road, West Dapto. This investigation followed on from Silcox's 1993 recommendation that the site had three areas of potential archaeological sensitivity. Area WD1 located within the lower slope and undulating creek flat landform was divided into five transects which were then sampled with a 35 test excavation units consisting of combination of auger holes and spade probes. One surface artefact was located at the western end of the identified WD1 Area. A series of ten random probes was excavated at 1-2 metres apart, averaging 28 centimetres in depth. Four additional artefacts were recovered and the area was recorded as site WD1 (AHIMS #52-2-1688). WD 2 Area was located within a low rise landform between a creek and a swampy cut-off channel. A total of five test excavation units along a single transect were completed, however no artefacts were recovered from any of these pits. WD 3 Area was subject to only three random spade probes as it was on a similar landform as WD 2. Again, no artefacts were recovered in this area.

Artefacts at the site WD1 (AHIMS #52-2-1688) were recovered from the upper 26 centimetres of the loam deposit within 1 metre by 2 metre area, and consisted of silicified wood, chert and quartz flakes and one unidentified sedimentary core. Navin Officer stated that it was unlikely the artefacts were *in situ*, due to the extensive land use modifications of the topsoil from where artefacts were recovered. Given the dense grass cover, size of the test area and the limitations of subsurface testing, Navin Officer considered that there was a possibility that more artefacts were present (both surface and subsurface) in WD1 Area. However, potential for archaeologically significant sites and/or undisturbed archaeological deposits was assessed to be minimal. Consent to Destroy was issued by the National Parks and Wildlife Service in 1993 in regards to site WD1 (AHIMS #52-2-1688).

Dallas and Sullivan (1995) prepared the Wollongong City Aboriginal heritage planning study to provide a management framework for known and predicted sites within the city of Wollongong. It provided advice to council through an appraisal of the Aboriginal cultural resources within the city for use in assessment of future development proposals. The study provided a predictive model for the presence of Aboriginal sites within the city of Wollongong based on known site locations. At the time of the study there were 1538 registered Aboriginal sites in the city of Wollongong. The majority of the sites were located in the Woronora and Metropolitan Water Catchment areas on the plateau, which reflects the intensive and large scale surveys of the Illawarra prehistory group and not a pattern of occupation. The study concluded that the data is heavily skewed to one landform – the plateau and sandstone country and therefore under represents the sorts of sites which occur on the coastal plain. This study revealed that the most common sites located on the coastal plains include shell middens and burials. On alluvial plains shell middens, artefact scatters and modified trees are more common compared to artefacts scatters and modified trees on the foothills.

The study concluded that the scarcity of sites within the Wollongong CBD is reflective of the degree of previous land use, relative lack of surveys and the fact that most sites on the coastal plain will only be present in a subsurface context. The majority of developments within the coastal strip predated requirements for impact assessment and therefore no studies were undertaken prior to the disturbance and/or removal of Aboriginal heritage sites. Dallas and Sullivan concluded it is highly unlikely undisturbed buried archaeological deposits would be found in these landscapes. They summarise by stating that sites along the coast and the coastal plain are under-represented. The present distribution relates to the degree of land disturbance and development, the lack of systematic site survey and subsurface testing.

Australian Museum Business Services (AMBS 2006) completed an Aboriginal Heritage Management Plan for the West Dapto Release Area (WDRA). This large scale study was commissioned by Wollongong City Council and encompasses the study area. From the initial survey program, a total of 24 archaeological sites were located within the boundaries of the WDRA study area, comprising 13 open camp sites, six isolated finds, and five scarred trees. These were positioned on all landforms including creek lines (6), alluvial flats (3), spanning creek lines and alluvial flats (3), hillslopes (8) and spur crests (4). A second stage of assessment consisting of subsurface testing of a 100 square metre area (100, 1 metre by 1 metre test pits) was

undertaken across all representative landforms of the Mullet, Duck and Marshall Mount Creeks catchment area. A third stage of testing was carried out at Darkes Road Town Centre and Bong Bong Road Town Centre.

A total of 425 artefacts (353 from within < 20 centimetres of deposit) were recovered from the following landscape contexts:

- Hillslopes (158, of which 146 were from one test pit).
- Alluvial flats -Pleistocene and Holocene terraces more than 10 metres away from stream channels (118).
- Streams- edges of Pleistocene and Holocene terraces within 10 metres of stream channels (86).
- Spur crests (63).

A range of raw materials were represented including, chert, quartz, quartzite, silcrete, silicified tuff and fine-grained siliceous. Artefact types included broken flakes, flakes, flaked pieces and cores. The range of raw materials and artefact types is considered characteristic of the region.

AMBS concluded that from known site patterning it is likely that additional archaeological sites may occur throughout all landforms of the WDRA at varying site and artefact densities. Subsequently, all parts of the study area are considered to have some archaeological potential. In general, the highest artefact density was encountered along second-order streams, followed by the first order streams, spur crests and then hillslopes. Although the artefact numbers recovered from individual test pit was low, high artefact recovery across all the landforms illustrate that the use of WDRA area was widespread, but not intensive. It was concluded that low density artefact scatters would be relatively common within the entire WDRA area.

The report recommended further investigation and management of those areas considered to have higher archaeological potential, including a number of spur crests within the Mullet Creek corridor, the benched foot slopes within the Escarpment foothills adjacent to creek lines and the lower tributaries of major creeks. These landforms would have provided camping sites, functioned as travel routes or provided a range of resources.

Areas of cultural value highlighted by the Aboriginal stakeholders throughout the development of this report are closely related to the archaeological record and the natural environment. All archaeological sites were identified as having cultural values, with the connection between cultural and natural values being emphasised. Large scatters and scarred trees were considered of higher significance, as were those sites retained within a natural setting. Conservation of important archaeological sites and natural areas such as creek lines and vegetated areas was a common theme identified among the Aboriginal stakeholder comments.

As part of the WDRA, AMBS commissioned Philip Hughes to complete a geomorphology / archaeological testing program prior to the commencement of the larger sub-surface investigation program. Hughes excavated a series of test pits using a combination of hand excavation and a backhoe within various landforms identified by AMBS. The geomorphic testing revealed that while all landforms had the potential to contain artefact-bearing deposits, archaeological evidence for Aboriginal occupation and use of the Pleistocene terraces would be restricted to the Holocene period. Artefact bearing deposits across all landforms comprise soft to firm soils and sediment. The depth of deposits varies across landforms, with the shallowest sediments occurring on ridges and hill slopes, and the deepest sediments occurring on Holocene terraces. 'Richer' archaeological deposits could be expected within Holocene terraces, but they would be disturbed by floods and perhaps buried in deeper alluvium. Artefacts were retrieved from alluvial flats at a maximum depth of 60 to 70 centimetres.

Three of these sites identified are artefact scatters located within the study area. WDRA_AX_08 (AHIMS 52-5-3290) consists of an open artefact scatter located 20 metres from Sheaffes Creek and a total of 13 artefacts were recovered from a 1 by 1 metre test pit. Artefacts recovered from the excavation consisted of chert,

quartz, silcrete, silified wood and fine grained silicious rock, while artefact types included one core, flakes, broken flakes, and flake fragments with two artefacts displaying retouch. A total of eight artefacts were recovered from two 1 by 1 metre test pits at WDRA_AX_09 (AHIMS 52-2-3291). This site is located 20 metres from a tributary of Robins Creek and consisted total of eight artefacts made from chert, quartz, silicified wood and silicified tuff. Three of the artefacts displayed retouch. WDRA_AX_07 (AHIMS 52-2-3292) is also an artefact scatter located 10 metres from Sheaffes Creek. A total of 24 artefacts were recovered from two 1 by 1 metre test pits and consisted of eight flakes, nine broken flakes and six flake fragments made from chert, quartz, silcrete, tuff and fine grained silicious rock.

Archaeological and Heritage Management Solutions (AHMS 2010) completed Aboriginal and historical archaeological and cultural heritage assessment for the proposed Stockland residential subdivision of land at Bong Bong Road in West Dapto. The proposed subdivision area is located within the spur crest running east-west along Bong Bong Road, which slopes towards Reid Creek to the south and Robins Creek to the north. Soils present are swampy alluvial deposits. Site prediction model from previous studies, particularly previous test excavations undertaken by AMBS in 2006, indicated that alluvial flats in association with lower order streams would contain low density open camp sites that represent short term and transitory occupation. One previously recorded Aboriginal archaeological site was located within the assessed area, WDRA_AX_47 (AHIMS 52-2-3277).

During the archaeological survey one artefact scatter, WDSY1 (AHIMS 52-2-3779) and one Potential Archaeological Deposit (PAD), WDY2 (AHIMS 52-2-3778) were identified. WDSY1 was located on a terrace between two arms of Robins Creek within an area identified as having archaeological potential by AMBS in 2006. A total of ten artefacts were recorded within two areas of exposure. Artefacts consisted of flakes made of silcrete, fine grained siliceous material, chert, chalcedony and banded chert. WDY2 was identified within a small triangular terrace of a tributary creek to Robins Creek. The terrace is about 20-30 metres from the creek and is 1.5 -2 metres above the level of the creek, in an area not subject to regular flooding. WDRA_AX_47 was tested by AMBS in 2006. A total of three artefacts, comprising silcrete and chert flakes, were recovered from three 1 metre by 1 metre test pits spread across approximately 50 square metres on a flat adjacent to Robins Creek tributary. Site WDY1 was assessed as having moderate archaeological potential. Recommendations were made to undertake further archaeological assessments if any impacts are proposed to any of the three registered Aboriginal sites.

Australian Museum Business Services (2010) was commissioned by Sydney Water Corporation, to prepare a preliminary Aboriginal and historic heritage assessment for the proposed water and wastewater infrastructure for the West Dapto Urban Release Area and its surrounding area which includes the study area. Their research area included from Wollongong Harbor, south along the coast to Bass Point and inland to the escarpment at Horsley. The aim of this preliminary assessment was to assist with the options analysis for the water and wastewater infrastructure, by providing an understanding of known and potential Aboriginal and historic heritage items, sites and places within the study area.

The study revealed that there were a total of 309 registered Aboriginal sites within their study area. Approximately 12 % of the area was assessed as having a high archaeological significance, 74 % moderate and 14 % a low significance. Portions of the coast were the areas assessed as having a high archaeological research potential. This rating was given because these areas contain Aboriginal sites, such as shell middens, which are indicative of Aboriginal coastal occupation and have the potential to contain large quantities of archaeological material. These coastal sites also have the potential to contribute to the knowledge of coastal occupation in Australia and therefore were assessed as having a high archaeological research potential.

GML (2015) were commissioned by Stockland to complete a review on the heritage context of all Stockland-owned lands in the Dapto area. This assessment included extensive background review, Aboriginal consultation, and some field survey to characterise the area. This assessment led to the revision of previous

predictive models and the formulation of a number of predictive statements relating to the local area. These statements have been summarised below):

- The area contains a number of alluvial terraces bordering the main creeks in the area. Suitable soil landscapes in these areas have high potential to contain subsurface archaeological deposits.
- The foothills landforms cantina numerous palaeochannels showing a long history of the landscape being reworked. Predictive modelling should not rely on current creek location, but should consider the location of these palaeochannels.
- Sites identified in the middle reaches of Robins and Duck creeks show a link to the extent of flood levels and Lake Illawarra water rises, showing that middens may occur up to 2.5 kilometres from the lake.
- The foot hills of the escarpment are the closest landforms with appropriate areas suitable for intensive Aboriginal activities. Alluvial terraces in this area with slopes of less than 3% are likely to have moderate to high potential.
- Sites on alluvial soils which have been excavated appear to contain stratified deposits, and such sites should be test excavated by stratigraphy to recover spatial data.
- Gravel beds are likely to have been used as sources for the extraction of raw stone materials. Future Investigations should aim to identify the sources of gravel beds and stone material.
- Archaeological sites may be connected with specific landscape locations, such as the upper outer bends of larger creeks, and may only extend 10 metres away from the bend in creeks. Conversely, archaeological sites may be found on sheltered alluvial landforms on flat terraces nestled between the creek bends.
- Archaeological evidence recovered from excavations on the coastal plain has been mainly limited to stone artefacts. Survey and excavation methodologies should allow for the identification or of the site types, including hearths. Based on the sandstone bedrock of the region, creek beds may show evidence of grinding.
- Those landforms associated with Aboriginal walking tracks may contain the greatest variety of archaeological evidence, with the potential for material brought up from the coast and down from the plateau.

3.3 Local context

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 10 kilometres of the study area). Most of these investigations were undertaken as part of development applications and included surface and sub-surface investigations. These investigations are summarised below.

Haglund (1983) completed an archaeological excavation on the foothills of the Illawarra escarpment approximately 6 kilometres from the study area. An initial foot survey of the area identified two new archaeological sites. Both were stone artefact scatters along a creek bank. Subsequent test excavation commenced. In total, six test pits were excavated evenly at each site on areas containing archaeological potential. At site A, two were considered undisturbed while test pit B was placed in a disturbed area. The test pits of site B were obviously disturbed. Overall, 18 artefacts were excavated from site 1 and 26 artefacts were excavated from site 2. This assemblage included predominately chert lithics, including cores are flakes, and petrified wood with some silcrete lithics as well. Low artefact levels, suggests Haglund, are the result of disturbance to the site in the form of erosional effects and modern construction.

Sefton's (1990) archaeological survey took place at Kanahooka, approximately 3 kilometres from the study area. The associated foot survey identified two isolated finds and a shell midden across the area. A later revisit to the site found additional shell and artefactual material. This amounted to three sites being identified: The first was associated with the midden and consisted of 51 pieces of shell material, the second with small silcrete flakes and an oyster shell. The third was associated with a silcrete flake and a chert flake. All were considered to be of low archaeological significance.

Navin (1993) undertook an archaeological investigation as part of the Local Environmental Planning Study located at Figtree approximately 3 kilometres north of the study area. The field survey consisted of a comprehensive coverage of ridge crests and shoulders, opportunistic inspections of ridge sides and lower slopes and flats, and walking transects along Brandy and Water Creek, American Creek and an unnamed creek in the Illawarra foothills. No Aboriginal sites were identified during the survey. It was considered that the absence of recorded sites during the survey most likely did not reflect an accurate archaeological site pattern as low ground surface visibility restricted the ability of sites to be detected. It was considered likely that sparse artefact scatters occur on the ridge crests and adjacent to the drainage lines on alluvial flats. It was recommended that a program of sub-surface testing be undertaken on the ridge crests and in the vicinity of any drainage lines in order to establish the presence/absence of Aboriginal sites in the proposed development area.

Dallas and Navin (1997) undertook a subsurface testing program as per the recommendations of Navin (1993). A total of five 500 metre grader transects were excavated across ridge crests, ridgelines and upper slopes. Eleven backhoe test trenches were excavated on the spurs and alluvial flats adjacent to Brandy and Water Creek, none of which were located within the current study area. One Aboriginal site was identified, consisting of three artefacts, within the ridge crest and ridgeline to its south. Artefacts were recovered over a distance of 20 metres within brown clayey loam soils with gravels, and consisted of silcrete, quartz and quartzite flakes. It was considered that this small density artefact scatter constituted 'background scatter' and was representative of traces of Aboriginal people using the area for travelling or camping.

Dallas (2002) undertook an archaeological assessment and excavation in Stuart Park, approximately 8 kilometres from the study area, as part of a proposed Lagoon restaurant development, 3 kilometres from the current study area. The Dallas study area was situated in a low dune landform on the periphery of a lagoon. Three test trenches of nominal length 2-3 meters, were excavated based on areas of least ground disturbance. A total of 65 artefacts and 13 shell fragments were identified in Test pit 1 (MT1). Test pit 2 (MT2) revealed two artefacts and 19 shell fragments. Artefacts in Test pit 3 (MT3) totalled 49 but consisted of zero shell fragments. The majority of artefacts from all test pits were complete flakes (n=51). Less frequent were flake pieces (n=31 and fragments (n=20). All test pits were disturbed, containing European materials. The results of this assessment show a higher concentration of occupation compared to what has been found on ridgelines in the e?Escarpment foothills, suggesting differences in landform use in the Illawarra region.

Navin Officer (2007) was commissioned to carry out an Aboriginal heritage assessment for a subdivision on Farmborough Road, Farmborough Heights approximately 2 kilometres from the study area. The study area was located on the footslopes of Mount Kembla, and is comparable to the current study area located on the footslopes of Mount Keira. One isolated artefact was identified during the site survey, located within an exposure beneath a mature Paperbark tree on a moderately steep basal slope adjacent to an ephemeral drainage line (Navin Officer 2007, pp. 12). It was considered that the isolated artefact represented part of background scatter and that its presence conformed to the generally low archaeological sensitivity for similar areas within the foothills between the western Illawarra coastal plains and the Escarpment (Navin Officer 2007, pp. 22).

Biosis (2012) was commissioned by Wollongong City Council to undertake an ACHA for the proposed realignment of Shone Avenue in West Dapto, approximately 4 kilometres west of the current study area. A field survey of the study area identified three PADs and sub-surface testing was undertaken to assess these

areas for presence of Aboriginal archaeological deposits and objects. Of the three PADs identified, PAD 1 contained areas of two previously recorded sites, low density artefact scatters Wongawilli, Camden (AHIMS 52-2-1033) and WDRA_AX_18 (AHIMS 52-2-3293). Sub-surface testing was completed in December 2011, resulting in expanding the boundaries of 52-2-1033 and 52-2-3293 and indicating that these sites represented the same site. It was concluded that 52-2-1033 is of low scientific significance as it is a low density artefact scatter containing a limited range of artefact types, lacks stratified deposits and is a common site type within the local region. Site 52-2-1033 has some, although limited potential, to provide new information about the exploitation of raw material and the site patterning across the region. An AHIP was issued by OEH (AHIP no. 1131695) to impact on parts of both Aboriginal sites.

Artefact (2013) were engaged by GHD to prepare a preliminary Aboriginal and non-Indigenous heritage assessment for the development of a 4 by 4 kilometre area between Farmborough heights and Mt Kembla that encompassing the previous assessment undertaken by Navin Officer (2007). They identified the previously recorded Aboriginal site (AHIMS 52-2-3592), identified by Navin Officer, and visited the site as part of their survey. Artefact supported the previous assessment of this site by Navin Officer (2007), stating that the foothills area demonstrated low potential for artefacts due to the steep sloping topography present across many of the hills and ridgelines there.

Biosis (2014) was commissioned by Cardno on behalf of RW Sheargold Pty Ltd to undertake an Aboriginal archaeological and cultural heritage assessment for the proposed large lot precinct for the Wongawilli Neighbourhood Master Plan development proposal, located approximately 5 kilometres west of the study area. An archaeological survey was completed that resulted in mapping areas of high, moderate and low archaeological sensitivity. A hill crest where a recorded Aboriginal site WDRA_AX_17 (AHIMS 52-2-3281) was identified during a program of sub-surface investigation by AMBS in 2006 was assessed as having high archaeological potential. Moderate sensitivity was determined for upper hill slopes, and low in other landforms due to the levels of previous disturbance (Biosis Pty Ltd 2014, p.46). Further archaeological testing was completed by Biosis Pty Ltd (2014) in 2013. The site extent of WDRA_AX_17 (AHIMS 52-2-3281) was determined and a new site, Wongawilli Village 1 (AHIMS 52-2-4103) was identified within the upper hill slope. Both sites were low density artefact scatters that are most likely remnants of people traversing the area or represent short-term camping grounds. The most suitable locations for short-term occupation for those travelling along the ridge line are likely to be on hill crest and gently sloped sections of the side slopes due to the more level gradient of these locations. Occupation within these landforms would have been transient, isolated events that might have been frequent in the hill crest as it offers the most expansive vista including views to the west that are not possible from the east of the crest (Biosis Pty Ltd 2014, p.49). An AHIP was issued in order to impact on both sites prior to the proposed development.

Biosis (2017b) was commissioned by ADM Architects to undertake an Aboriginal cultural heritage due diligence assessment for 141 Darkes Road, Kembla Grange, two kilometres south of the study area. The project proposes to subdivide the study area into 6 residential town houses and 6 multistorey apartment buildings, and will include associated, pedestrian pathways, roads and car parking areas. The AHIMS search results identified that no sites were located within the study area; however, three of the AHIMS results were located within 500 metres of the study area, two on a hill landform 400 metres south of study area, and one on an alluvial terrace 100 metres north of the study. A review of archaeological reports conducted in the region showed that Aboriginal sites have occurred in similar landforms exhibited by the study area, including alluvial floodplains, which is the predominant landform within the study area. However, testing completed within the floodplain landform has determined that artefacts occur sporadically and in low densities. Australian Museum Business Services (2006) assessed the study area as low to moderate potential as a result of test excavations in the vicinity and recommended no further assessment. Biosis conducted an archaeological survey of the study area and no previously unrecorded Aboriginal sites or objects were located. The assessment identified a range of disturbances associated with farming and residential practices throughout the study area. A lack of Aboriginal sites in the study area, the presence of disturbances,

preferable occupation areas to the north and south, results of regional modelling and previous assessments of the study area suggest that the study area has low archaeological potential.

Niche (2018) were commissioned by Cardno to undertake an ACHA for inclusion in a Development Application for Wollongong City Council to develop the Vale Precinct, which forms part of the Vista Park Estate 5 kilometres west of the study area. No new Aboriginal sites were identified as part of this field assessment, although an area of PAD was identified to the east of the Coral Vale homestead. Test excavations were conducted within the PAD and a new Aboriginal site (Smith's Lane OCS – 1) was uncovered consisting of 28 artefacts of chert, fine grained silcrete, silicified wood and volcanic stone. The artefacts were not interpreted to be in situ, and no stratified archaeological deposits were present; therefore, the artefacts are likely to be in the general vicinity of where they were discarded.

3.3.1 Identified Aboriginal archaeological sites

An extensive search of the AHIMS database was conducted on 13 January 2020 (Client service ID: 474799). The search identified 16 Aboriginal archaeological sites within a 5 kilometre search area, centred on the proposed study area (Table 3 and Table 4). None of these registered sites are located *within* the study area (Figure 3). The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied where notable discrepancies occurred.

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area.

Table 3 AHIMS search results

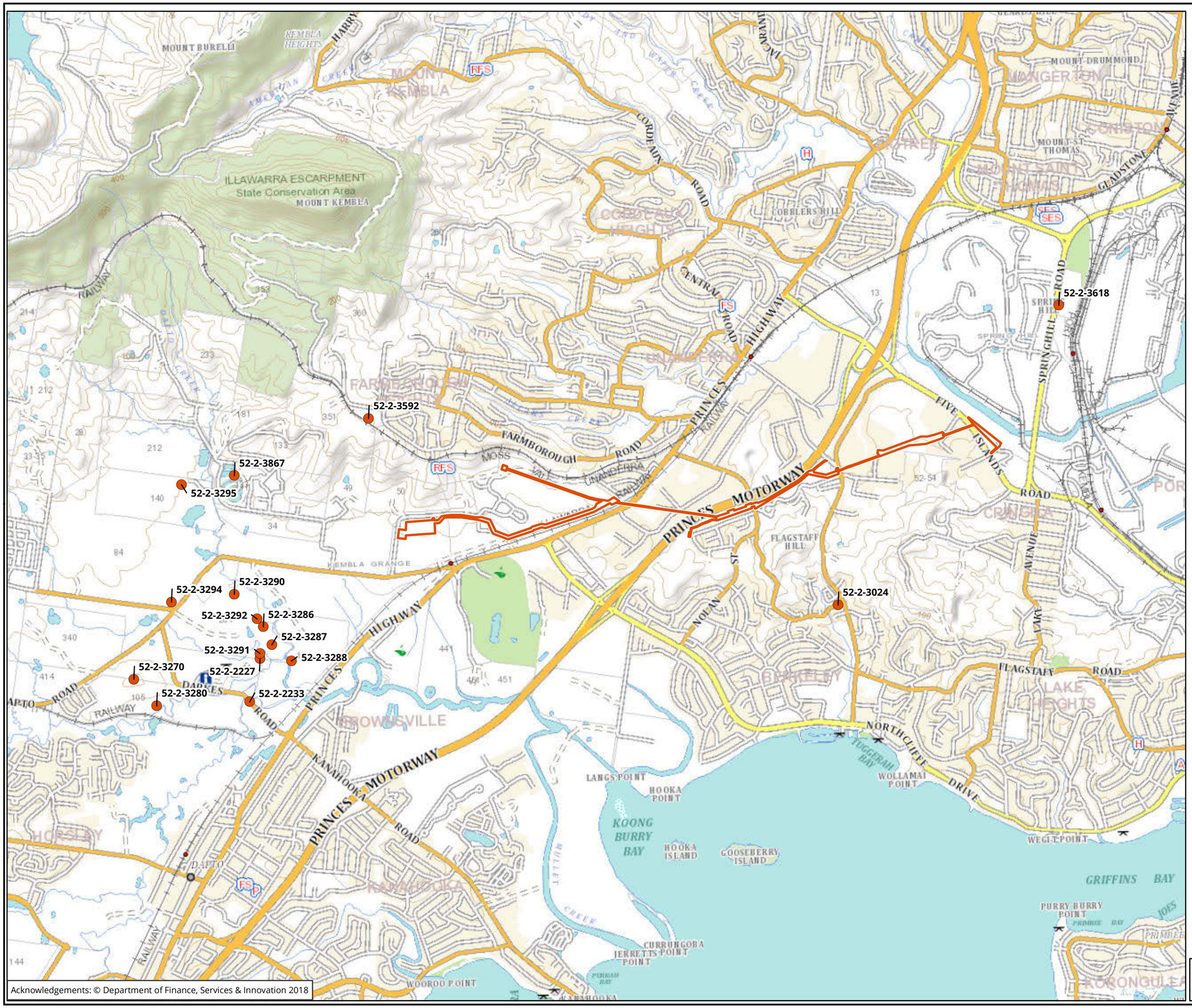
AHIMS site no	Site name	Site type
52-2-2227	Test Pitting Area 21	Artefact
52-2-2233	Test Pitting Area 22	Artefact
52-2-3024	BR1 Berkeley	Artefact
52-2-3592	Farmborough Road IF 1	Artefact
52-2-3867	RR2	Artefact
52-2-3618	BSS-OS-1	Artefact
52-2-3286	WDRA_AS_04	Artefact
52-2-3287	WDRA_AS_05	Art (Pigment or Engraved)
52-2-3288	WDRA_AS_07	Artefact
52-2-3270	WDRA_AX_42	Artefact
52-2-3280	WDRA_AX_15	Artefact
52-2-3290	WDRA_AX_08	Artefact
52-2-3291	WDRA_AX_09	Artefact
52-2-3292	WDRA_AX_07	Artefact
52-2-3294	WDRA_AX_10	Artefact

AHIMS site no	Site name	Site type
52-2-3295	WDRA_AX_11	Artefact

Table 4 AHIMS sites within the study area

Site type	Occurrences	Frequency (%)
Artefact	15	93.75
Art (Pigment or Engraved)	1	6.25
Total	**16**	**100**

A simple analysis of the Aboriginal cultural heritage sites registered within 5km of the study area indicates that the dominant site type is artefact, representing 93.75% (n=15) of site types. Art (pigment or engraved) sites contribute only 6% of site types (n=1). This is likely the result of extensive land clearing and construction activities in the Dapto and Kembla Grange areas. All sites were located within close proximity to the reliable sources of water or were either exposed by the land clearing works (artefact scatters).



Legend

- Study area
- AHIMS record

Figure 6 AHIMS records near the study area

NOT TO BE MADE PUBLIC

0 500 1,000 1,500

Metres

Scale: 1:30,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

biosis

Biosis Pty Ltd

Albury, Ballarat, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

N

Matter: 31411
Date: 14 January 2020,
Checked by: SJK, Drawn by: AEDm, Last edited by: amurray
Location:P:\31400s\31411\Mapping
31411_ADDA_F6_AHIMS

3.3.2 Predictive statements

A series of statements been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located.

This model is based on:

- Local and regional site distribution in relation to landform features identified within the study area.
- Consideration of site type, raw material types and site densities likely to be present within the study area.
- Findings of the ethnohistorical research on the potential for material traces to present within the study area.
- Potential Aboriginal use of natural resources present or once present within the study area.
- Consideration of the temporal and spatial relationships of sites within the study area and surrounding region.

Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 5). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 5 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	Moderate: Stone artefact sites have been previously recorded in the region on level, well-drained topographies in close proximity to reliable sources of fresh water. However, due to heavy disturbance on the study area, the potential for artefacts to be present within the study area is assessed as moderate.
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	Moderate: PADs have been previously recorded in the region across a wide range of landforms. PADs are likely to be present within areas adjacent to water courses or on high points in undisturbed landforms.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: Shell midden sites have not been recorded within the vicinity of the study area. There is a very low potential for shell middens to be located in the study area due to the distance to the closest permanent water source.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.

Site type	Site description	Potential
Modified trees	Trees with cultural modifications	Low: Scarred trees are not recorded within the vicinity of the study area. Due to extensive vegetation clearance only a small number may survive in the study area, if at all.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: No suitable horizontal sandstone rock outcrops exist within the study area..
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the study area are not commonly associated with burials.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which don't occur in the study area.
Aboriginal Ceremony and Dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are traditional stories related to lake Illawarra, but these do not extend into the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Aboriginal Places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the study area.

4 Archaeological investigation

An archaeological investigation of the study area was undertaken on 17 and 21 January 2019 by Samantha Keats, Consultant Archaeologist and Paul Cummins from the Illawarra LALC. The survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey aims

The principle aims of the survey were to:

- Undertake a systematic survey of the study area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of Aboriginal archaeological and cultural sensitivity.

4.2 Survey methods

The survey was conducted on foot. Recording during the survey followed the archaeological survey requirements of the code and industry best practice methodology. Information that recorded during the survey included:

- Aboriginal objects or sites present in the study area during the survey.
- Survey coverage.
- Any resources that may have potentially have been exploited by Aboriginal people.
- Landform elements, distinguishable areas of land approximately 40m across or with a 20m radius (CSIRO 2009).
- Photographs of the site indicating landform.
- Ground surface visibility (GSV) and areas of exposure.
- Observable past or present disturbances to the landscape from human or animal activities.
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

Where possible, the identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, GSV and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Global Positioning System and the Map Grid of Australia (94) coordinate system.

4.3 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factors that contributed most to the effectiveness of the survey within the study area were GSV. The study area had a low GSV due to the extensive grass coverage and industrial parts

across the study area and relatively small areas of exposure. Furthermore, access to some portions of the study area that consisted of industrial areas was not possible, but these areas were assessed as being subject to extensive disturbance due to the subsurface impacts associated with the construction of industrial structures and associated utilities.

4.4 Visibility

In most archaeological reports and guidelines visibility refers to GSV, and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (DECCW 2010b). GSV across the study area was typically low (5%) due to extensive grass coverage (Plate 6) and construction of industrial areas and road corridors (Plate 7), which would not allow for the detection of surface sites such as stone artefacts. Small areas of high GSV were present along access tracks, car parking areas, in areas of deposited fill, and where erosion and excavation had recently occurred.

Plate 6 South facing photo showing extensive grass coverage across the western portion of study area, which reduced the ground surface visibility

Plate 7 West facing photo showing road and footpath construction, which reduced the ground surface visibility

4.5 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, pp. 79, DECCW 2010b). Overall, the study area displayed areas of exposure less than 5% due to extensive grass coverage. Areas of limited exposure were located where water erosion had occurred (Plate 8), scours at the base of trees (Plate 9), and along access tracks.

Plate 8 West facing photo showing areas of exposure from recent erosion

Plate 9 East facing photos showing areas of exposure at the base of trees

4.6 Disturbances

Disturbance in the study area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scouring. Disturbances associated with recent human action are prevalent in the study area and cover large sections of the land surface. The agents include residential and commercial development such as landscaping and construction of buildings; farming

practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing; and construction of major infrastructure such as rail and road corridors.

The study area has been subjected to extensive vegetation clearance, which would have resulted in the removal of topsoil and caused shallow disturbances. In the eastern portion of the study area, industrial development (Plate 10) has severely limited the potential for intact subsurface deposits to occur, while in the western portion, massive amounts of coal slag and fill have been deposited and developed into sports fields (Plate 11, Plate 12 and Plate 13). Road and rail corridors along with service installations (Plate 14) have caused severe and significant disturbances in the center portion of the study area. Furthermore, the existing pipeline alignment has created massive disturbances across the study area except for four areas where the route has deviated. The original disturbance corridor is approximately 20 metres wide and 1.2 metres deep.

The results of the visual inspection are outlined in Figure 7.

Plate 10 Extensive grass coverage and significant disturbances from industrial development within the eastern portion of the study area, facing north-east

Plate 11 The western portion of the study area has been modified to create a level area for sports fields, facing west

Plate 12 The extent of the coal slag and fill that created a level area for sports fields in the western portion of the study area, facing west

Plate 13 The laydown area at the western end of the study area showing significant disturbances, facing south

Plate 14 Extensive and disturbances created by the rail corridor and installation of services in the centre of the study area, facing south

4.7 Investigation results and discussion

The assessment for areas that have low, moderate or high archaeological potential within the study area is based on a number of factors, including environmental conditions, geomorphological processes, past land use activities, results of previous archaeological studies, surveys and test excavations, results of the current survey and site predictive modelling for the region.

The study area consists of moderately steep upper slopes and mid slopes in the western portion, while the centre is defined by lower slopes and flats. The eastern portion is situated on moderately steep mid slopes. Several drainage lines and creek lines are associated with the study area; however, these watercourses have been altered from their natural positions due to modern developments. Streams and creeks on the gently sloping coastal plains are unconfined by topography and have extensive flood plains, which a large part of the eastern portion study area is situated on, and would have been subject to a number of flood events that likely disturbed any surface artefacts present at the time.

The Disturbed soil landscape dominates the study area. It is defined by the overwhelming presence of unnatural depositional features and is the result of disturbance by human activity to a depth of approximately 100 centimetres (Hazelton & Tille 1990, pp. 104). In these cases, the original soil has been either removed, disturbed or buried making the potential of Aboriginal site to occur nil to low. The Fairy Meadow soil landscape is the next largest landscape to occur within the study area. It characterised by soils that are seasonally wet, with water tables frequently close to the surface and parent soil material that includes large amounts of accumulated decayed organic matter (Hazelton & Tille 1990, p.100). Swamp soil landscapes such as the Fairy Meadow soil landscape would preserve sub-surface deposits and archaeological material due to their aggrading nature.

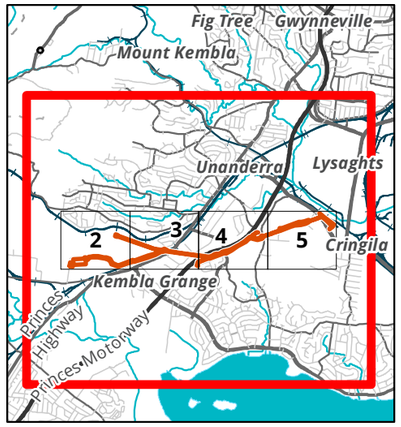
The survey revealed that most of the study area had been subject to extensive ground disturbances due to the initial vegetation clearing, construction of industrial buildings and infrastructure, and the modification of the landscape by the deposition of coal slag and fill and construction of a road and rail corridor with associated services. No Aboriginal objects or areas of PAD were identified during the survey.

In addition, the proposed pipeline alignment will predominantly follow the route of the existing Port Kembla lateral and is approximately 20 metres wide, which allows both pipelines can fit in the same easement, and has been disturbed to a depth of 1.2 metres. However, there are four areas where the route will deviate due to insufficient room within the existing easement or due to industrial development having taken place along the pipeline easement since the original line was installed. The total length of these four areas is approximately 1.6 kilometres. The new areas of the pipeline alignment are located within either the Gwynneville or Disturbed soil landscape. Soils of the Gwynneville soil landscape are shallow and are susceptible to erosion and mass movement, which will cause the displacement of any potential Aboriginal sites downslope. They also lack stratified deposits and defined horizons and are not fully developed.

The easement dedicated to the HDD equipment, where only top stripping of vegetation will be required, is located north of Wollongong Lawn Cemetery mostly within the Fairy Meadow soil landscape. As discussed above, this soil landscape may preserve sub-surface deposits and archaeological material due to their aggrading nature. Upper terraces of the Fairy Meadow soil landscape can have a soil depth greater than 100 centimetres; however, the location of the easement for the HDD is situated within relatively steep topography making this location for camp sites unsuitable.

A widespread study of the Dapto area undertaken by AMBS (2006), and encompassing part of the study area, indicated that sites would be found in all landforms with densities of sites in the following order from highest to lowest: hillslopes, second order streams, first order streams, third order streams, alluvial flats, fourth order streams, and finally spur crests. This model was revised by a heritage land review undertaken by GML Heritage (2015), who identified that alluvial terraces with slopes of less than 3% are likely to have moderate to

high potential for Aboriginal sites. Alluvial terraces were not present within the study area, while the second order stream that transects the western portion has been heavily modified by the creation of a slag pile that now contains sports fields.



Legend

- Study area
- Survey tracks

Figure 7.1 Survey effort

0 250 500 750 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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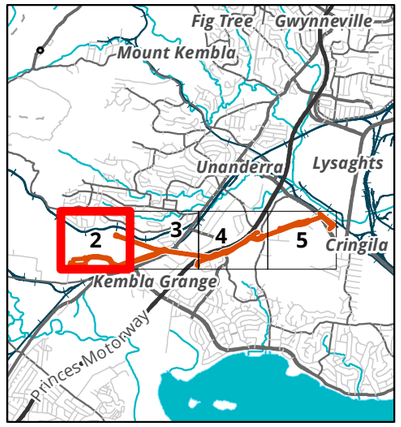

Legend

Study area

Survey tracks

Figure 7.2 Survey effort

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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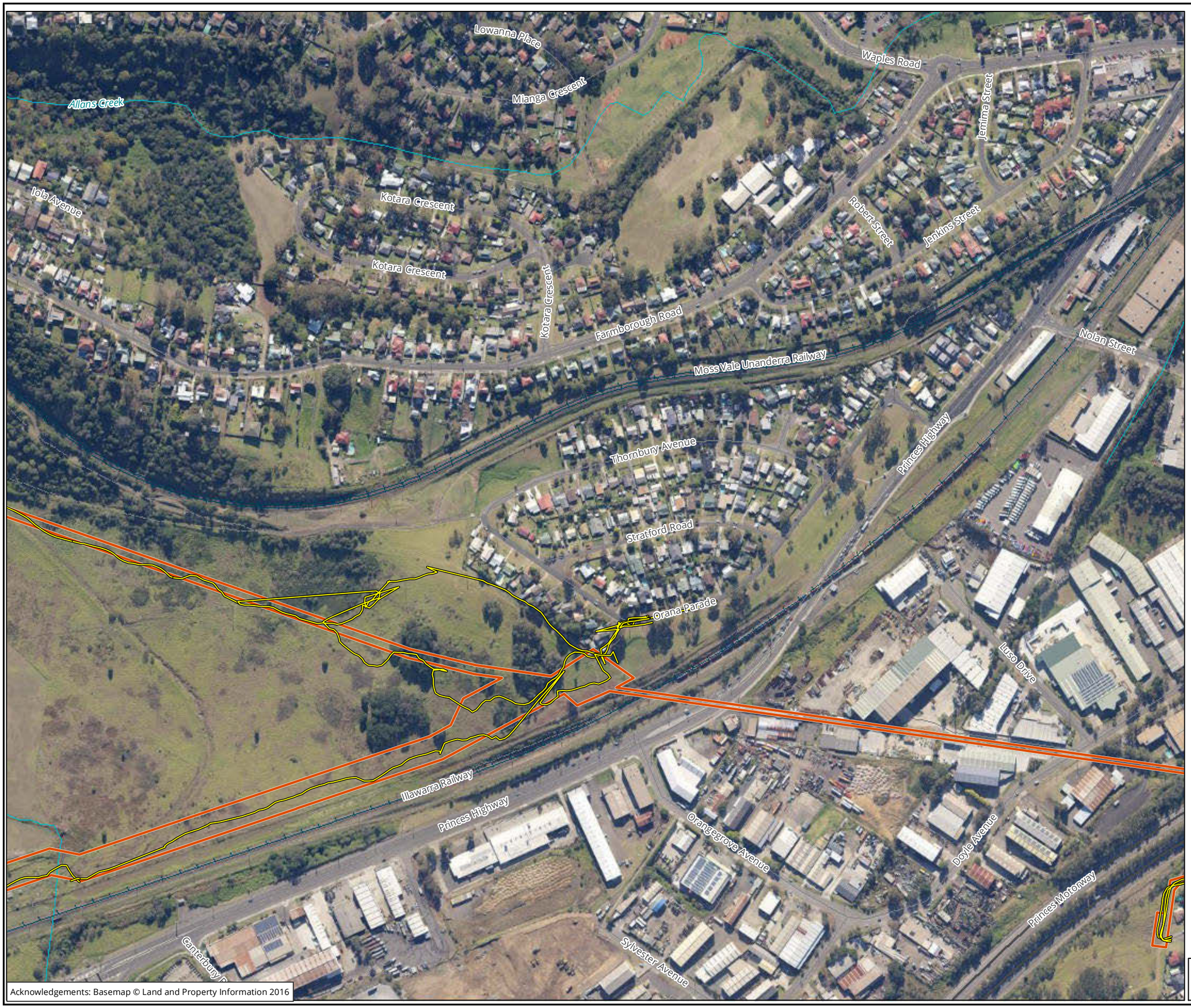

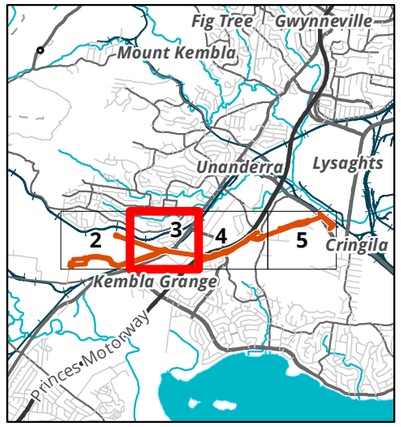

Legend

Study area

Survey tracks

Figure 7.3 Survey effort

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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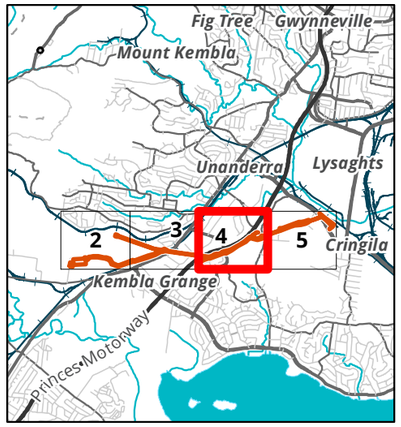

Legend

Study area

Survey tracks

Figure 7.4 Survey effort

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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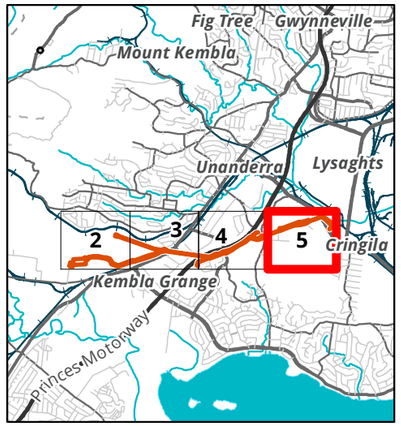

Legend

Study area

Survey tracks

Figure 7.5 Survey effort

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Study area
- Disturbance - Easement (existing and proposed)
- Disturbance - Other

Figure 2.1 Disturbances within the study area

0 250 500 750 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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31411_ADDA_F8_Disturbances

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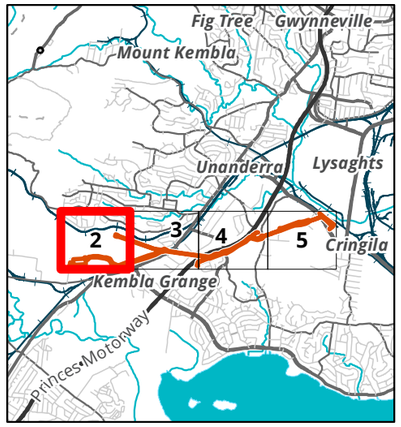

Legend

- Study area
- Disturbance - Easement (existing and proposed)
- Disturbance - Other

Figure 2.2 Disturbances within the study area

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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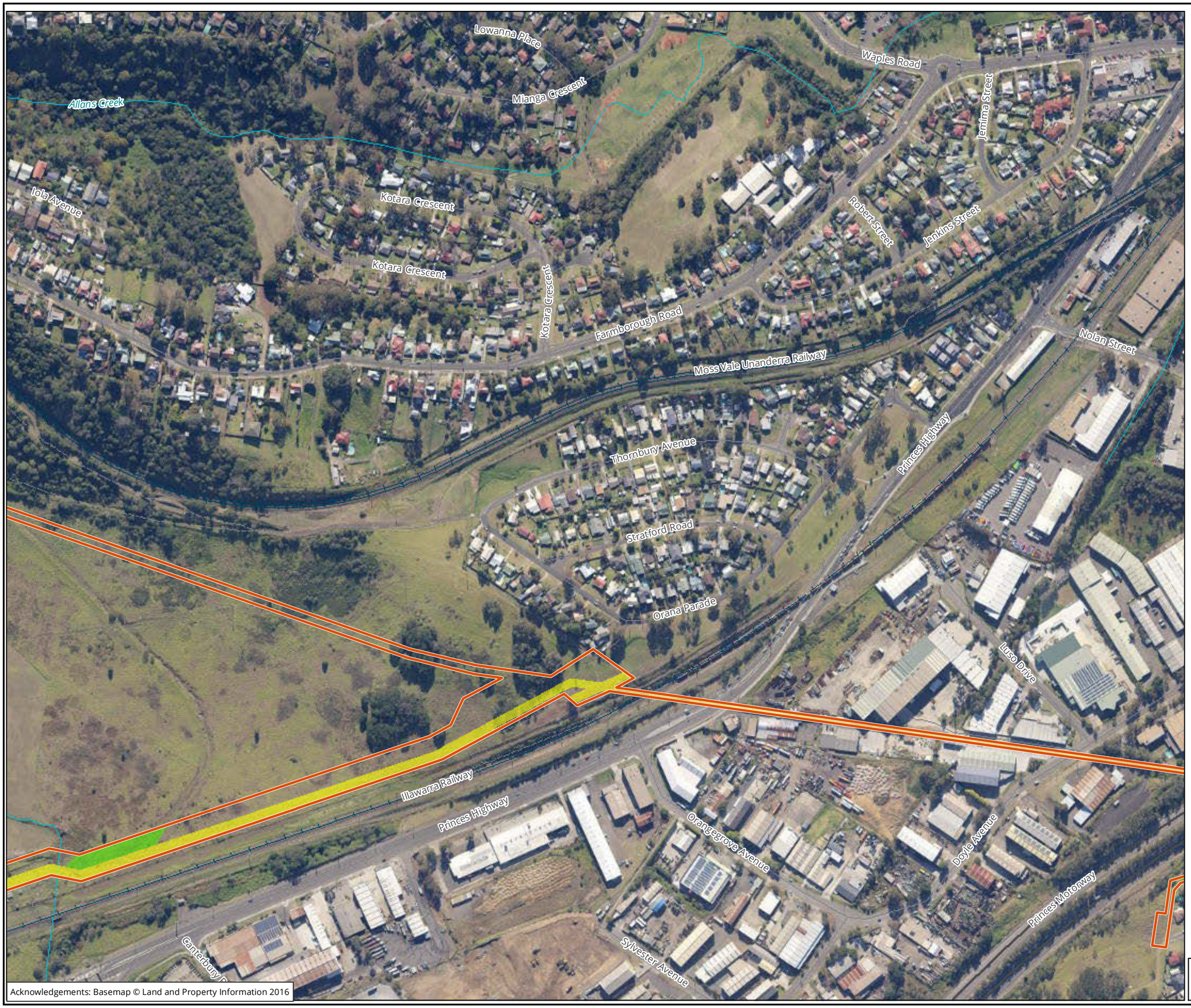

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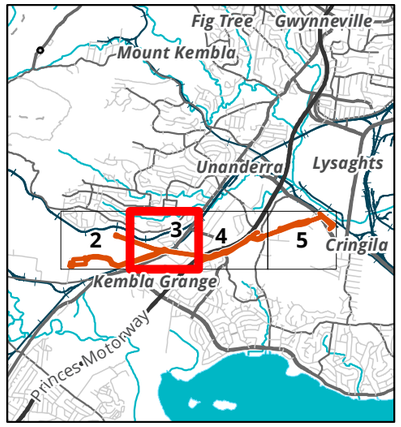

Legend

- Study area
- Disturbance - Easement (existing and proposed)
- Disturbance - Other

Figure 2.3 Disturbances within the study area

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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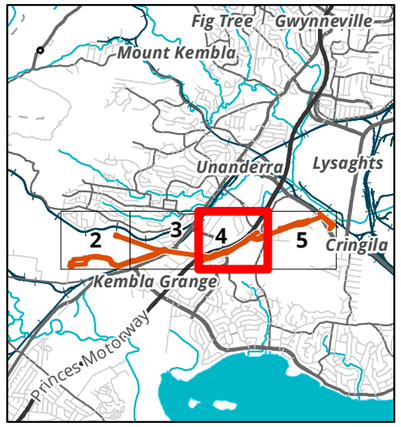

Legend

- Study area
- Disturbance - Easement (existing and proposed)
- Disturbance - Other

Figure 2.4 Disturbances within the study area

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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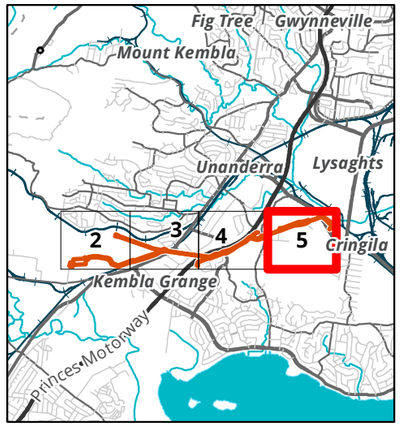

Legend

- Study area
- Disturbance - Easement (existing and proposed)
- Disturbance - Other

Figure 2.5 Disturbances within the study area

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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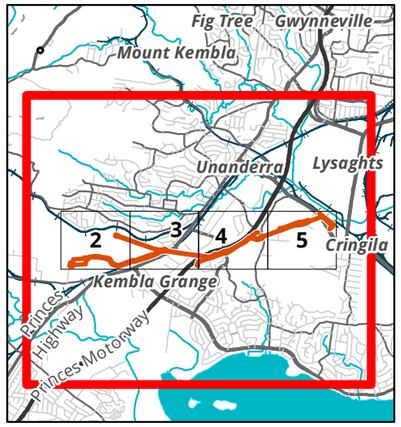

Legend

Study area

Archaeological potential

Low

Figure 7.1 Survey results

0 250 500 750 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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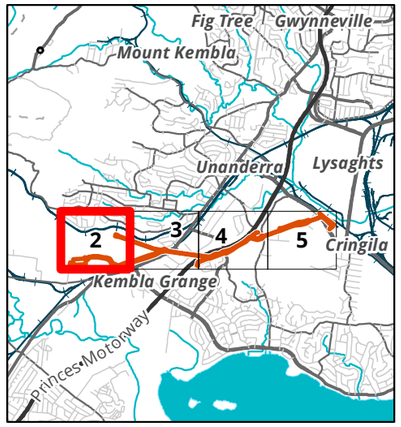

Legend

Study area

Archaeological potential

Low

Figure 7.2 Survey results

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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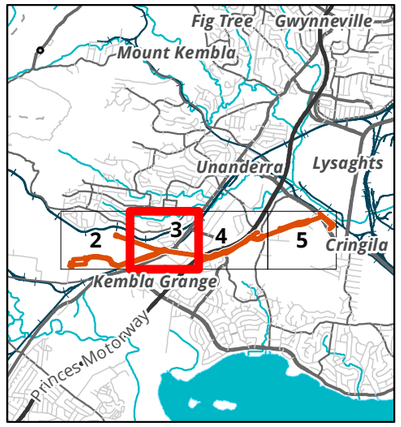

Legend

Study area

Archaeological potential

Low

Figure 7.3 Survey results

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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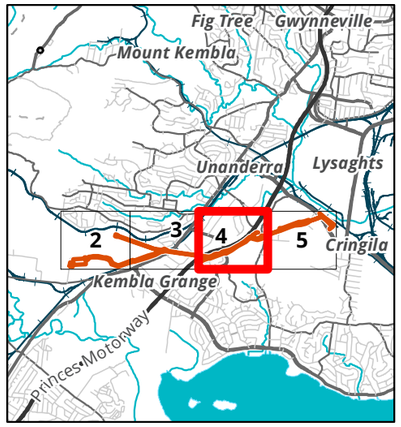

Legend

Study area

Archaeological potential

Low

Figure 7.4 Survey results

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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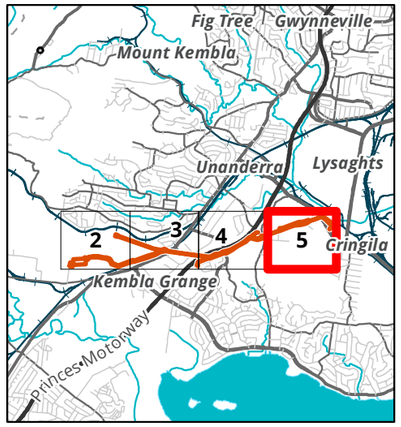

Legend

Study area

Archaeological potential

Low

Figure 7.5 Survey results

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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5 Conclusions and recommendations

5.1 Conclusions

This assessment has identified that the entire study area has low archaeological potential. This assessment was made based on background research that identified that the entire study area had been subjected to past land clearance for agricultural use, and that a large portion of the study area has been subjected to industrial activities as seen in the widespread occurrence of the disturbed soil landscape. In addition, the Gwynneville soil landscape also indicates that the potential for cultural material and potential archaeological deposits to remain is low. The Fairy Meadow soil landscape may preserve archaeological material; however, the location of this soil landscape within the study area would have been subjected to multiple flood events.

The overall effectiveness of the survey for examining the ground for Aboriginal sites was considered to be low due to both low GSV, predominantly due to vegetation cover, and the low amount of exposures. No new sites were discovered during the archaeological survey. There is low likelihood for potential archaeological deposits to be present within the study area due to the landforms and soil types and disturbances; therefore, no further archaeological assessment is required.

5.2 Recommendations

The following management recommendations have been developed relevant to the study area and influenced by:

- Predicted impacts to Aboriginal cultural heritage.
- The planning approvals framework.
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter (2013).
  - The Code.

Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area assessed as having low archaeological potential.

Recommendation 2: Discovery of Unanticipated Aboriginal Objects

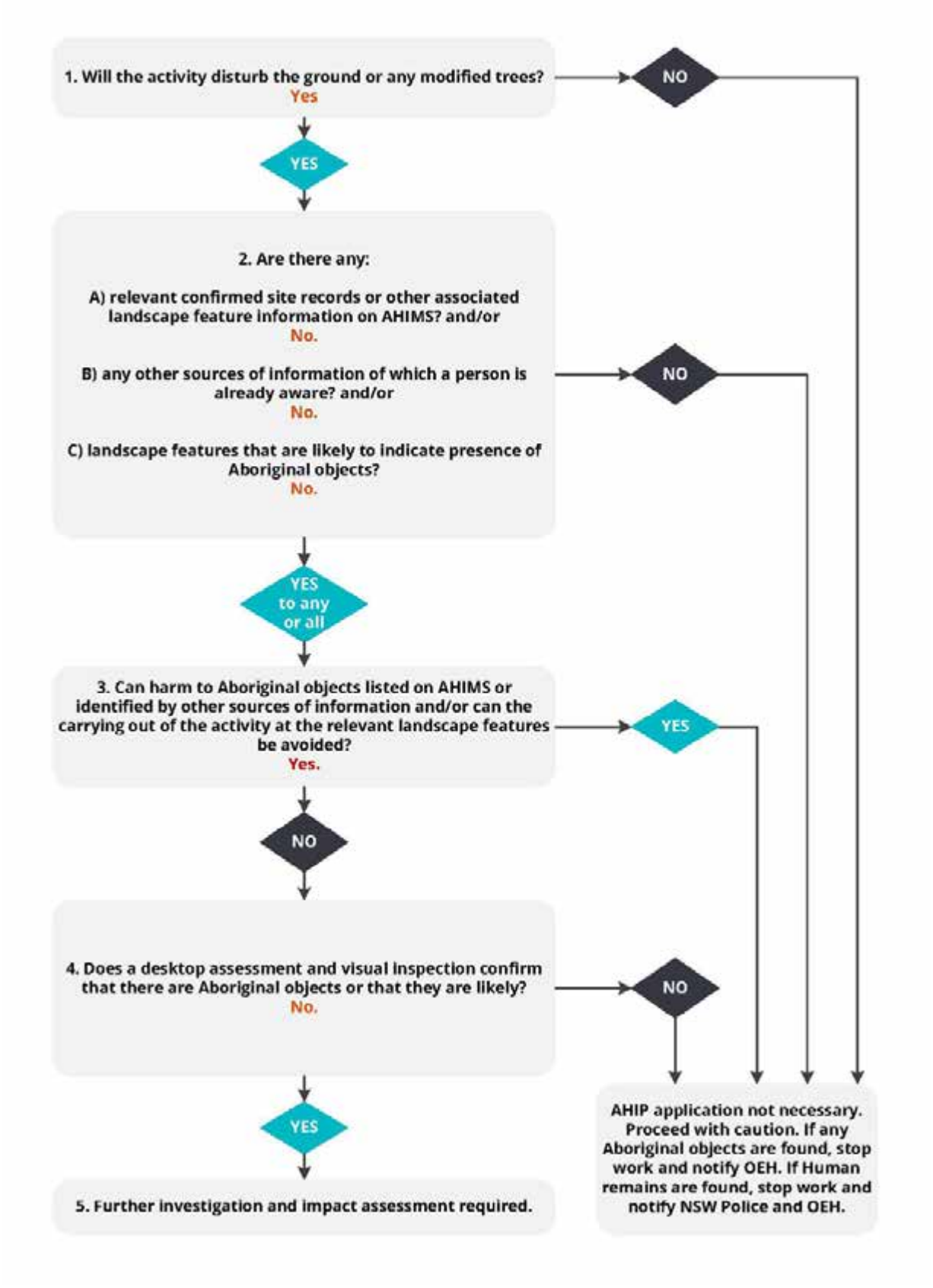
All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the EES. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the EES and Aboriginal stakeholders.

Recommendation 3: Discovery of Aboriginal Ancestral Remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify the NSW Police and EES' Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by EES.

Figure 10 Due diligence flow chart



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